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The Brayton Petroleum Engine.

The petroleum engine shown in the perspective view upon this page was designed to fill the requirements of small steam engines without the necessity of hiring an engineer and incurring the usual risks attending the use of steam. This engine was also calculated to run at a much less cost than is generally incurred by the coal consumption of steam boilers, assuming that petroleum when properly used, is one of the cheapest fuels known. It may be used in localities where neither steam nor gas engines could be profitably employed; especially where the power required is intermittent.

The bedplate is hollow and contains an air reservoir made of wrought iron plate with steel heads, and strongly riveted to stand a test pressure of 300 pounds per square inch. This reservoir is to contain a quantity of compressed air for feeding the flame in the cylinder. The engine here represented is what is termed a 5-horse power and has a single-acting cylinder, 8″ diameter with a stroke of 12″. The internal construction and operation of the piston and valves may be better understood from the engravings showing vertical section through the cylinder *A*, and fire head *H*. It will be observed the cylinder has a space about it through which cold water *W* is made to circulate, forming a water jacket. The piston *B*, also, is hollow; water is introduced by a hose *G*, through one piston rod *C*, and is conveyed through a hose *G*, at the other end to the water jacket upon the cylinder and fire head, being finally conducted through the water-head *I*, to the waste. The ends of the piston rods extend through the cross-head *E*, to which they are secured by nuts, as shown, while power is transmitted to the crank through the connecting rod *F*, in the usual way.

The piston is made tight by cast-iron packing rings *D*, and all are well lubricated by the condensation of the products of combustion upon the cool surface of the cylinder. The length of the piston is equal to the stroke of the engine. The fire-head *H* contains the combustion chamber *N*, in which a flame is constantly maintained, which makes it unnecessary to ignite the vapor at each stroke. Through the vertical opening *O* a flame is introduced into the combustion chamber, after which the opening is closed by a valve called the fire stop. The combustion chamber is divided into two parts by a perforated partition *P*, *P*, composed of three or four diaphragms of fine wire gauze held between two perforated plates for protection. Outside this partition is an annular groove packed with a porous cotton braid *S*, called an evaporator, into which the oil is forced through the pipe *Q* by an oil pump. This pump is operated by an eccentric upon the lower end of the governor spindle. The valve of the pump is of a solid piece of metal, and is operated by an eccentric just above the one for working the pump, thus furnishing a positive valve movement and avoiding any trouble that might arise from sticking of the valves, stopping the supply of oil to the cylinder. In starting the engine the vent *R* is withdrawn a sufficient distance to admit a small jet of air through the evaporator. This air performs two important functions, viz.: to vaporize the oil, and to supply enough oxygen to keep the flame alive. As soon as the jet of air is admitted, a few turns of the crank at the top of the governor spindle will operate the oil pump, injecting a small quantity of oil which is at once vaporized by the air. The fire-stop is then opened and a match applied which ignites the vapor. The supply of vapor or gas to twelve parts of air. As the gases burn while entering the cylinder (communication being open between the air reservoir and cylinder) there can be no direct increase of pressure in the cylinder in consequence of ignition, but the effect is to hold back several volumes in the air reservoir that would have escaped had the gases not been ignited. The air pressure in the reservoir is created and maintained at a maximum pressure of about 80 pounds per square inch in this engine by an air compressor attached to the end of the shaft, as shown in the perspective view.

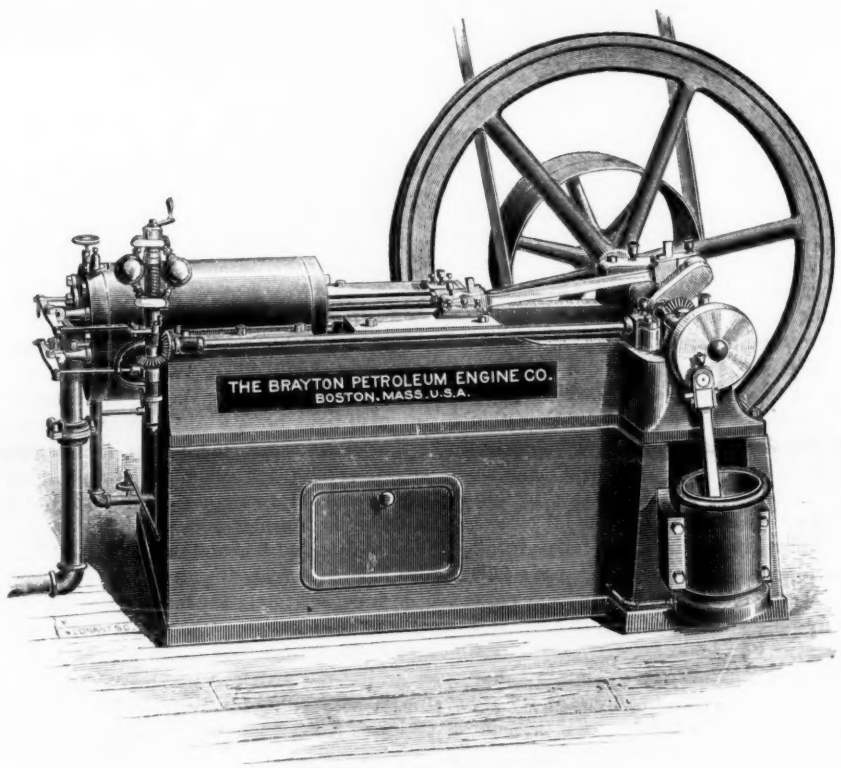
The details of this compressor are shown in the sectional view, where *A* represents the cylinder *B*, the piston made tight by the packing rings *E*. The connecting rod *C* is attached to this piston by means of the pin *D*, and an adjustable connection to take up lost motion. *H* is the induction valve, and *L* the discharge valve, through which the compressed air passes into the passage *M*, thence to the reservoir. The compressor head *F* has a recess *W* for water circulation to keep it cool. The capacity of this compressor is sufficient under all circumstances to maintain a constant air pressure in the reservoir. By constant use the wire gauze diaphragms will become obstructed so as to hinder the free passage of air through them, therefore once in every six days they should be removed and cleaned. This is an operation that requires but a very few minutes, as the diaphragms may be easily removed by taking off the bonnet *K* in the sectional view of cylinder; then, by holding the diaphragms singly over the flame of an oil lamp, the deposit will be quickly converted into white ash, which is easily removed by a stiff brush. The exhaust bonnet *U* can be readily removed, exposing the exhaust valve *T* for cleaning. This valve is operated by a fixed cam upon the governor spindle, while the air pressure valve *L* is moved by an adjustable cam attached to the governor.

The supply of oil is regulated by an automatic cut-off for regulating the stroke of the oil pump. The oil may be kept in a tank in any desired locality where it can be easily conveyed to the engine. The exhaust pipe may be run either through the side of the building or into the chimney, as may seem most convenient. The supply of air and oil can be so nicely adjusted that the combustion will leave no deposit of unconsumed carbon in the cylinder, nor will any be wasted. The combustion that occurs in this engine, while exceedingly rapid, is not an explosion, as will be seen from the accompanying indicator diagrams, Figs. 1, 2, 3, which were taken from an engine of the size here illustrated.

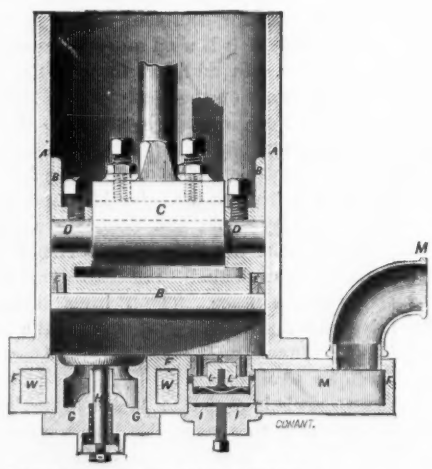
When the air valve cuts off the supply, the combustion expands the air which maintains the pressure, forming the expansion line, as shown in the diagrams on page 2, Fig. 1 was taken with the engine running the compressor alone, while Fig. 2 shows an average load. Fig. 3 shows 6.79 indicated H. P, after deducting 5.13 H. P. for friction and operating the compressor.

In taking these diagrams the pencil was kept in contact with the paper during several revolutions to get a fair average. The cost of oil to operate this engine is, of course, an important consideration.

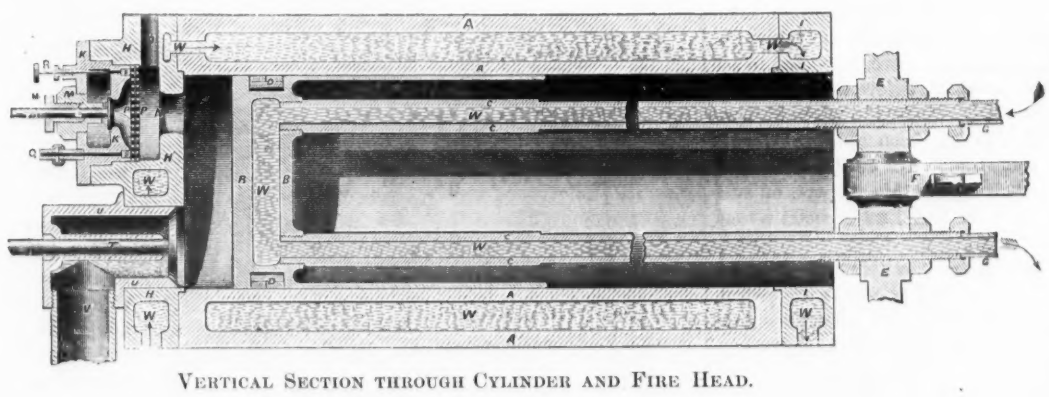
The oil is crude petroleum, having a specific gravity of about 55°, which is preferred to any of the other hydro-carbons, although any of them may be used. It is claimed by the



THE BRAYTON PETROLEUM ENGINE.



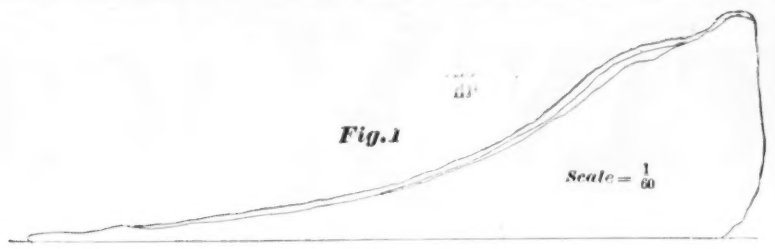
SECTION OF AIR COMPRESSOR.

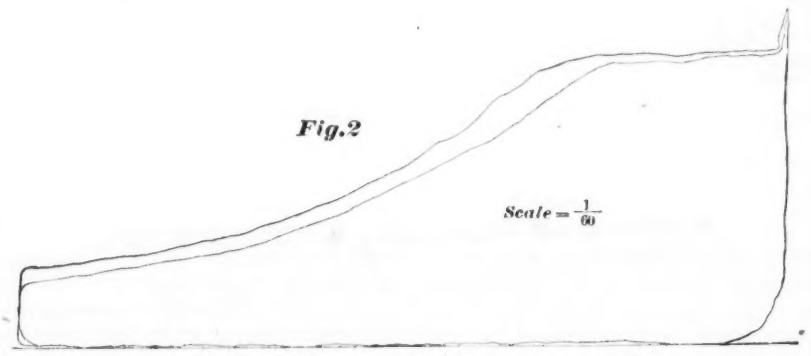


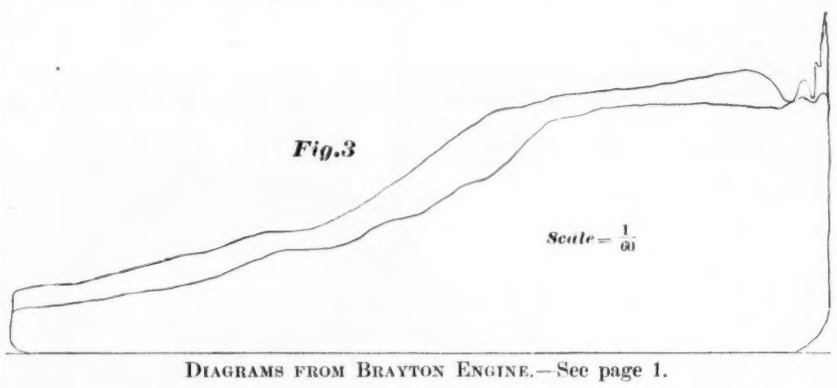
VERTICAL SECTION THROUGH CYLINDER AND FIRE HEAD.

manufacturers of this engine that ten gallons of crude petroleum, at a cost of six to eight cents per gallon, will develop five horse-power for ten hours. By the very sensitive automatic governing devices for oil and air, the rate of consumption is limited in proportion to the load upon the engine.

The method adopted for determining the power of these engines is by applying the indicator and taking diagrams, from which the net power is easily estimated. Its simple mechanical construction, together with the fact that it may be started at full speed within a few seconds, as well as the small floor space occupied, seem to adapt this engine for general small-power purposes. They are made in different sizes up to 30 horse-power by the Brayton Petroleum Engine Company, 50 Federal street, Boston, Mass.







DIAGRAMS FROM BRAYTON ENGINE.—See page 1.

Invention and Manufacture.

As a rule, when a mechanic makes an invention, he immediately devotes his energies to establish himself in its manufacture. Generally he has little means, and if he succeeds in starting in a small way he puts himself and his invention at the disadvantage of competition with others who are more favorably situated, and the result is not infrequently that, with the advantage of superior merit, and perhaps the possibility of cheaper manufacture in his favor, he finds himself to all intents excluded from available competition by the superior manufacturing facilities of his competitors. The failure of hundreds of meritorious mechanical inventions can, beyond question, be traced to the fact that their manufacture was attempted without the means necessary to success. In this respect, the inventor fails to take the advantage, to which he is entitled, of the last ten years' change in manufacturing methods—an advantage which would lead to his own success, instead of to his failure, and also benefit the community by the utilization of valuable ideas too often lost.

Generally speaking, the inventor need trouble himself but little about the purely manufacturing part of the business of placing his invention, if it possesses real merit, before the public. He will find those whose business it is to manufacture (not invent) ready to relieve him of this burden, by placing at his disposal such an outfit as he could not provide for himself short of an outlay, in itself not less than a fortune that would place him above all financial need of inventing or manufacturing.

Twenty years ago these things were managed differently. Then the inventor had not only to invent, but if he ever expected to see his invention brought before the public, he must in some way contrive to place it there himself. But, as has been aptly said, such things at that time were *built*, not *manufactured*. All being, in this respect, on substantially the same basis, no especial wrong was worked.

Under the present system of machine shop practice, standard products are manufactured, and the difference between manufacturing and building is widening every day. It is doubtful if this change works in any sense to the detriment of the inventor (except it may be in isolated instances which no conditions could cover) even if he has no means beyond that necessary to secure his invention, if he takes the advantage that he may take of the changed conditions. On the contrary, it is probable that inventors, as a class, may, if they do not, profit more than any other class by these changes.

It is undoubtedly to most inventors a positive luxury to see the products of their brain grow into tangible form under their eye and supervision, but it is a luxury, generally speaking, for which some other and less expensive one should be substituted.

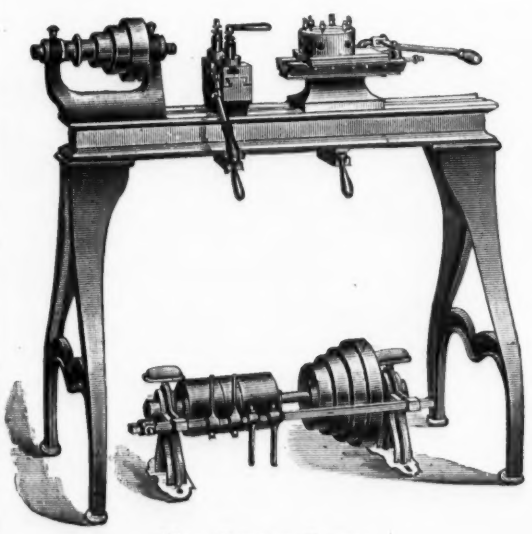
Another feature of the case worth considering is, that between inventing and manufacturing there is a wide difference; more than between the extremes of mercantile pursuits, or as much difference as between building and selling. Hence it by no means follows that the inventor, notwithstanding his undoubted mechanical ability, is at all fitted to superintend the extensive manufacture of even his own invention.

In any mechanical device which is to be brought into extended use, its invention is only the first step, and not necessarily the hardest one, in what is to be done. There remains after this step the providing for its systematic manufacture and introduction, and the inventor who fails to take advantage of the organized means to these ends fails to make use of one of the elements of success. The change in manufacturing processes is permanent, and underlies all probabilities of mechanical success. It will not change to suit minor conditions, important though they may be. When the inventor has something worth manufacturing, it by no means follows, however, that, because he lacks the means to manufacture on a scale necessary to insure success, he must throw away what would otherwise be of value. So far from this being true, manufacturing has so shaped itself as to offer him peculiar advantages if he only uses them.

The two processes—inventing and manufacturing—are in a broad sense separated by the logic of progress, and it is not, ordinarily, wise to waste much energy in an endeavor to bring them together. It is wiser to take advantage of existing conditions that are good, than to try to make new ones.

New Turret Lathe.

The engraving which accompanies this, represents a 13½ inch swing turret lathe, especially designed for the use of manufacturers of light brass work, such as telegraph and electric instruments, valves, lubricators, etc., and also for other than brass work where several tools are used and quick handling is desirable.



NEW TURRET LATHE.

It is fitted with a hollow tapered spindle, the hole in which is $\frac{17}{64}$ inch in diameter. The front bearing is 1½ inches diameter and 2¾ inches in length. The boxes are of gun metal, and both bearings are provided with adjusting nuts. The cone has four changes for 1½ inch belt. The turret is 6″ diameter, and is fitted for six tools, and has a stroke of 5″.

The cut-off slide has two tool posts operated by lever motion. Both cut-off slide and turret have stop motion. The counter shaft has forward and back motion.

This machine is manufactured by James Aitchison, 50 and 52 Canal street, Cleveland, Ohio.

Says the California *Architect and Building News:* "Employes in all lines of mechanical operations are at present receiving advanced pay over the rates ruling during the last former five years. The general revival of business in California has restored a healthful tone in the labor market, and the demand being equal and in some lines greater than the supply, the tendencies have been in favor of the working classes, as the absorption of surplus in supply in all cases is the next thing in effect to positive insufficiency."

The largest steel spring ever made has been successfully rolled at Kloman's steel works, Pittsburgh, Pa., for the United States Car Motor Company, of Philadelphia. The spring is 310 feet long, 6 inches wide, and one-quarter of an inch thick. It was tempered and coiled by the motor company at their works in Philadelphia, and exhibited in the bi-centennial parade.

Boiler Defects and Boiler Bracing.

During the month of August last 2,026 visits of inspection were made by the inspectors of the Hartford Steam Boiler Inspection and Insurance Company. The number of boilers examined was 4,309. Of these 25 were condemned. The defects found numbered 2,637, of which 519 were of such a character as to seriously impair the safety of the boilers. The report published in the October issue of *The Locomotive*, says:

"The large number of broken and loose braces which we find every month is a pretty sure indication that there is abundant room for improvement in workmanship on the part of some boiler-makers. If a brace is properly made and attached to a boiler, there is no more reason why it should ever break or get loose than there is for a plate in the shell to become loose and fall into the furnace. But that they do break, and get so loose that they might as well be broken, is very certain.

"The ways in which braces fail are various, and depend upon the construction of the brace itself, as much as anything else. One of the commonest faults to be met with is a deficiency in the size of the eye, where the brace is attached to angle or T irons. We have actually seen braces an inch in diameter, with the eye part not over one-half an inch square, and this merely bent so as to form a hook instead of being bent around and welded as it should have been. As might be expected under the circumstances, the hook was well straightened out, and the head of the boiler badly bulged.

"One of the best forms of brace is made by welding a crow-foot to the end of the brace which is attached to the tube sheet, and riveting the whole thing rigidly to shell and head. If one could be sure that the weld were always sound, this would be a first-class brace for parts of a boiler that are exposed to the fire; but unfortunately this is not the case. All experiments that have been made show that the strength of a welded joint is a very uncertain thing, and cannot be depended upon to be much more than one-half the strength of the solid part of the bar.

"A very common way of attaching braces is to rivet two angle irons to the tube sheet, make the brace with a single eye, and fasten with a pin. The objection to this method is that the angle irons cover too much of the plate, and the space between them forms a lodging place for sediment, which is apt to give trouble if it is used on surfaces exposed to the fire. In addition to this, the claw-hammer strain on the heads of the rivets in the angle irons is apt to loosen it so that the braces become slack.

"The best method of connecting braces is to rivet T irons to the tube sheet and attach the brace by a pin and double eye, taking care to make the double eye of such a size that its strength shall be at least equal to the body of the brace. The T irons should be riveted radially to tube sheet, and the braces also arranged radially. In this manner all oblique strains are avoided, as well also as all twisting of the brace to make the attachment to the shell. For surfaces exposed to the direct action of the fire, however, the plain crow-foot brace is to be preferred.

"The model brace for all parts of a boiler will not probably be designed until we can obtain mild steel castings which can be depended upon every time. Then a simple crow-foot with a *double eye* may be cast, and the body of the brace made simply of a flat piece of iron with a hole drilled near the end, and fastened to the crow-foot with a straight pin. This would seem to be the most simple and reliable form of brace that could be desired."

It is said the following method may be successfully employed to recover tin from scrap: Make a lye from hydrate of soda, or potash and water, which heat to the boiling point and add an excess of any oxide of lead. The application of this will dissolve the tin, leaving the other metal.

One of the greatest difficulties encountered in setting machinery, particularly machine tools on the upper floors of a building, is in securing the necessary stability. In places where land is of small value one-story shops have become the rule, but in large cities the cost of sufficient floor space in this way is a serious obstacle. We recently noticed a plan adopted by Mr. Jordan, superintendent for E. W. Bliss, for setting a planer on the second floor, at the works, which seems to answer the purpose admirably. Strong iron H beams were securely bolted to the underside of the floor timbers, the timbers being previously spotted so that the beams should lie fairly against their surface. These beams were in position, under the legs of the planer, and the floor was cut through so as to allow timbers to be placed on the beams with the grain of the timber lying vertically. On these beams the legs of the planer rested. It will be seen that the iron beams tie a number of floor timbers together, thus making of the timbers and the iron beams a foundation substantially in one piece and not likely to be influenced by local strains. Placing the timbers vertically is important, as in this way shrinking of the wood will not affect the alignment.

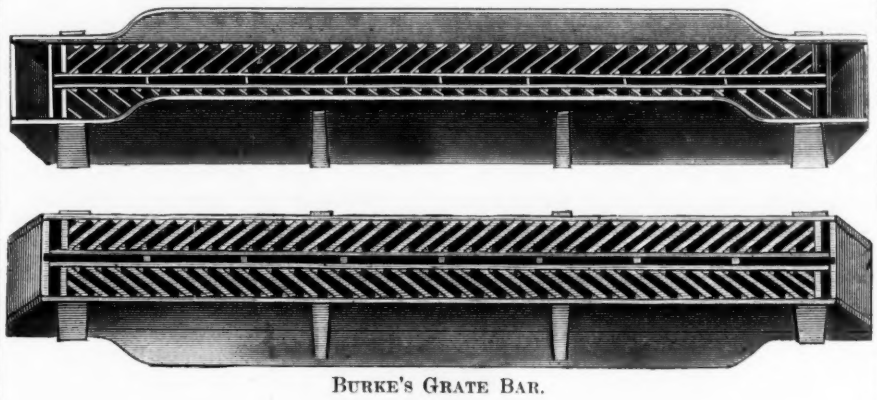
Burke's Grate Bar.

We present with this engravings representing in two views a new grate bar for the furnaces of steam boilers, the design of Thomas Burke, a practical engineer of 2247 First Avenue, New York City. In making this bar the intention has been to secure such a construction as to give the requisite strength with the least amount of metal that it is practicable to use; to dispose of the metal in such a way as to do away with the tendency to warp and burn out, and to provide the maximum of air opening, so disposed as to distribute the air uniformly through the fire, thereby reducing the quantity of air necessary to maintain combustion, and resulting in fuel economy.

It will be seen that this bar is provided with angular openings at the sides, the direction of these openings being towards the rear and center of each section of the grate. The object of this is to direct the entering air both to the center and back end of the fire. At the same time, to prevent undue concentration of the air, the bar is provided with a central longitudinal opening, the air entering at this opening serving the purpose of quietly diffusing the general air supply through the angular openings so as to make the total supply uniform to all parts of the fire.

This longitudinal opening also provides for an equal distribution of metal, thereby securing equal section and strength, and what is quite as important, provides against the local heating of parts, and secures uniform expansion and contraction, thus greatly reducing the loss from breakage.

This bar, other general features of which may be seen by an inspection of the engravings, is designed for any sized furnace, either with or without center bearers.



BURKE'S GRATE BAR.

Protective Labor Laws.

The *Boston Commercial Bulletin* has a leading editoral on labor legislation, in which it contends that Massachusetts through her legislation has always specially regarded the rights of laborers. It says:

To-day the situation of the working man, woman and child is about as follows: Suppose he or she is occupying a tenement house: the law says the house must have plenty of light and air, good sanitary surroundings, and means of escape in case of fire. Similar laws are in force regarding the factory in which the operative works, and in addition the belting, shafting, gearing, etc., in factories must be securely guarded; machinery can not be cleaned while running if the factory inspectors consider it dangerous; hoistways, hatchways, elevators, etc., must be provided with safeguards and approved by the inspectors; main doors of factories must open outwardly, and means for extinguishing fires must be provided on every story; the use of inflammable or explosive compounds is regulated; females are required to be supplied with seats when not actively employed, and corporations must, at their own expense, cause their operatives to be vaccinated.

No child under ten can be employed in any business establishment; no child under fourteen can be so employed without twenty weeks schooling in each year, no minor under eighteen, and no woman can be employed more than sixty hours in a week. When a person or corporation requires notice of intention to leave from employes, the latter are given legal right to insist on similar notice. No person can use intimidation or force to prevent any other person from working for whom he chooses unless in violation of law.

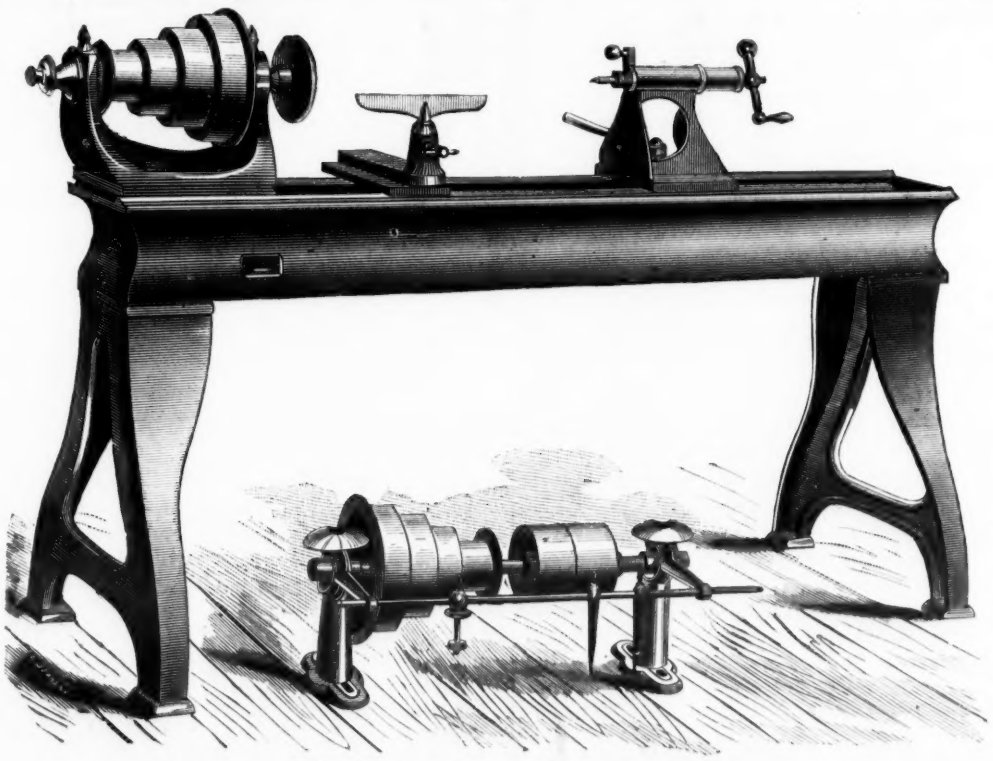
The wages of a wife or minor children cannot be attached for the debts of the husband or father. If a working man is sued for a bill owed by him for necessaries, $10 is exempted from attachment; if the bill is for other articles than necessaries, $20 is exempted. The laborer or mechanic who works upon buildings, land or vessels is given a lien upon such property for the satisfaction of his claims. The wearing apparel and farming utensils of every person, his household furniture not exceeding $1,000 in value, and a mechanic's tools to the value of $300, are exempt from taxation.

A debtor may hold secure from attachment $100 worth of tools, implements and fixtures, $100 worth of stock or materials, and a sewing machine. In case of insolvency, wages due an operative, clerk or servant to the amount of $100 are preferred claims, and come next to Government debts or taxes in order of settlement. Corporations are not allowed to make contracts with operatives by which the latter would be deprived of compensation if injured by the negligence of employes; corporations which import laborers must give a bond that such persons, or those equally dependent upon them, shall not become paupers within two years.

From the above, it appears that the old Bay State has the most wholesome and progressive labor laws of any State in the Union. The *Bulletin*, however, does not contend that all these laws are *enforced*. Perhaps more stringency in executing the laws is all the governmental reform that is needed.

Coke for Foundries and Locomotives.

In our issue of May 27, 1882, we published a letter from a large New England machinery establishment giving comparative results of using coal and coke for melting iron in their foundry cupolas. The comparison showed that while it cost $1 a ton for melting with coal, it cost but 86 cents a ton, for melting with coke. The castings made from coke melting were softer and cleaner, and not more than one-half the power was required for the blast. Recently two or three railroads have been experimenting with coke as fuel for locomotives. The results are reported uniformly successful. The dirt, gas and smoke that annoy passengers so much are avoided, and passenger coaches kept much cleaner and more comfortable. We are not informed as to the difference in cost, but even if coke is more expensive, the greater comfort to passengers ought to be a sufficient reason for continuing its use.



NEW HOLLOW SPINDLE SPEED LATHE.

Hollow Spindle Speed Lathes.

The engraving presented herewith is that of a 16″ swing speed lathe made from new patterns by Messrs. Fay & Scott, Dexter, Me. In construction the bed of this lathe, having tie wards, is much like ordinary lathes except that it is extra heavy. The length of bed over all is 6 feet. The spindle is of hollow steel and has ground journals. The boxes are of hard cast iron scraped to a fit. The cone is turned inside and out, insuring a perfect running balance. The tail spindle and screw are of steel. There are four changes of speed for a belt 2¼″ wide. The rest holder is held upon a plate fitted to slide upon the ways and is readily secured in any desired position by a cam holder at the back within easy reach of the operator. A tool rest is furnished with this lathe when required. The distance between centers is 3′ 10″. Length of head spindle, 16½″. Diameter of hole through spindle, $\frac{9}{16}$″. Diameters of journals: small $1\frac{1}{16}$″, large $1\frac{1}{8}$. Diameter of tail spindle, $1\frac{7}{16}$″. Tight and loose pulleys on counter-shaft, 6″ diameter with face 3″ wide. Weight of lathe complete ready for shipment, 535 pounds, This lathe is adapted for spinning, drilling hand-tooling, polishing and light chucking. Each of these lathes is tested in actual service before leaving the works.

After the adjournment of the organizing meeting on Thursday, October 26, 1882, the delegates representing the newly formed National Association of Stationary Engineers called in a body (by invitation) at the office of the AMERICAN MACHINIST, and passed a pleasant hour. Appreciating fully the aims of the new association, and the systematic and harmonious manner in which its organization had been effected, we were very glad to note the intelligence and high character of the representative men present. The constitution provides that no engineer shall be eligible to membership in any of the local bodies without passing a rigid practical examination as to his engineering qualifications. When we consider the responsibility for the safety of life and property which rests upon the men whom these delegates represent, the wisdom of this test of membership becomes apparent.

In elevating the standard of proficiency among the members of their profession, the newly-formed organization conserves the interests of the whole community, and we believe they will find the community in entire sympathy with their efforts. The next meeting of the association will be the regular annual meeting, and will be held in October, 1883, the time and place for which will be hereafter determined.

The Manufacturers' and Mechanics' Fair in Boston.

The fair of the New England Manufacturers' and Mechanics' Institute has proved so successful that it is to be extended two weeks beyond the time originally fixed for closing. It will close about the middle of November.

With the Porter Allen engine are exhibited valves, pistons, packing, crossheads, rods, and, in short, each piece detached that goes to make up that engine.

The Exeter Machine Works, Exeter, N. H., have added to their exhibit a Brayton petroleum engine. A description of this engine will be found upon another page.

The Hancock Inspirator Company, Boston, Mass., exhibit, in connection with a full line of their inspirators, a new ejector for lifting and transferring liquids.

It is claimed that these ejectors will lift water 25 feet, and force it from 10 feet to 40 feet above the apparatus in proportion to the steam pressure carried upon the boiler.

The Ashcroft Manufacturing Company, Boston, Mass., and 111 Liberty street, New York, have a very fine exhibit of steam, hydraulic, vacuum and other pressure gauges. They also exhibit their test-pumps and gauges put up in a most portable form for inspectors of boilers. A pair of the latest style of Tabor's steam engine indicators is also exhibited by this firm. One of them may be seen attached to the Hartford (Buckeye) engine, and diagrams taken with the same have been freely distributed.

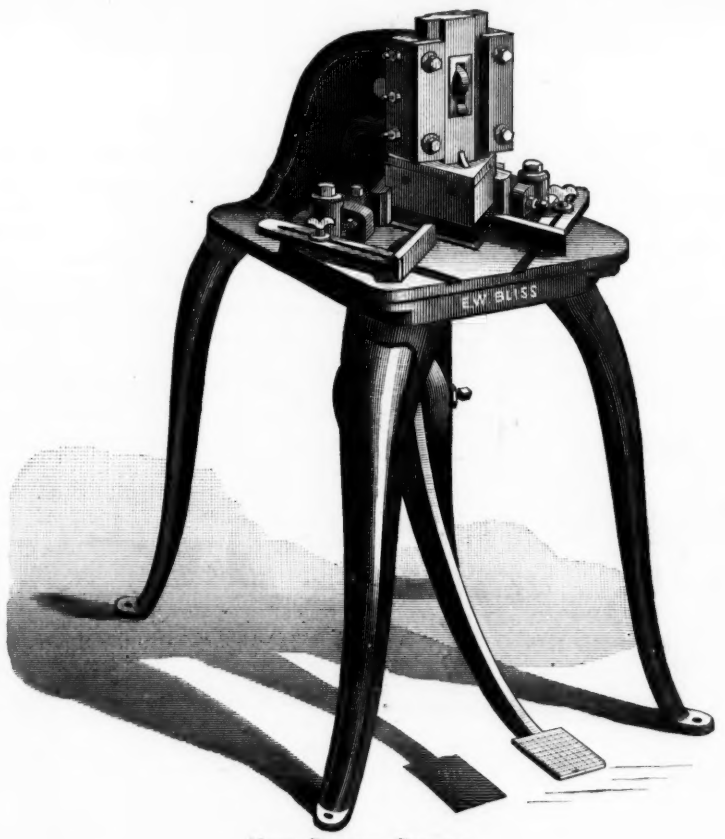
The Consolidated Safety Valve Co., Boston, Mass., and 111 Liberty street, New York, also exhibit a full line of the Richardson Pop Safety-Valves. Several essential improvements have lately been made in the details of these valves which enhance their value.

The Crosby Steam Gauge and Valve Co., 97 Oliver street, Boston, Mass., exhibit a very complete line of steam, hydraulic and other pressure gauges. The space occupied by their goods is large and their general appearance is fine. They have a pair of their new Crosby No. 2 Indicators on exhibition, together with planimeters, and other appliances that go to make up an engineer's outfit.

New Corner Cutter.

We present with this an engraving of a very strong and serviceable corner press, just brought out by E. W. Bliss, Plymouth, Pearl and John streets, Brooklyn, N. Y. This press is designed for use in making paper boxes, cutting the corners from 0 up to 5 inches each way, and will cut through stock piled up to one inch in height. The stock to be cut is guided by means of adjustable guides, in grooves planed in the face of the table. These guides are readily arranged for cutting corners of any dimensions up to the limit of the machine.

The cutters instead of being in two pieces, are solid, which provides for cutting a perfect corner. To guard against springing, the outer edges of the cutters are fitted with guides. The cutting is done by means of a foot lever, which is connected with the cross-head by means of a slot fitted with a steel die, which can be adjusted to take up any lost motion that may result from wear. To adjust the stroke of the lever two set screws are employed. A heavy weight attached to the lever serves to steady the motion in cutting, and also provides for a quick return motion. The cross-head is fitted with gibs for compensating for wear.



NEW CORNER CUTTER.

Thoughts About Thinking.

BY F. J. MASTEN.

"The ability, more often the willingness, to think out a system of details, or a course of action, * * * * is the one great point of vantage that many mechanics miss."

These words, in the AMERICAN MACHINIST of October 7, are well and timely uttered. To know how to think, how to reason from cause to effect, or the effect being known, to reason to the cause, and to be able to grasp with the mind all the different parts of a problem or proposition, and reason to a sound conclusion, constitutes ability that cannot be acquired without an effort, nor retained without practice.

Unskilled brains are as useless as unskilled hands, and it is thinking, sound methodical thinking, that trains the brain.

For unwillingness to think, I know of no remedy. It is as incurable as any other form of laziness.

In good faith men have complained that they could not understand some of the articles in the AMERICAN MACHINIST; that the articles were beyond their ability to understand. Perhaps some article that troubled these readers was written by one who had given ten years' attention to the subject, and had taken ten hours to arrange and write out his ideas; then the reader expects to grasp it all in ten minutes' reading.

I cannot comprehend, to my satisfaction, an average article in the AMERICAN MACHINIST with once reading. The article I have quoted from I read twice, and then returned to read again the words quoted. Others, perhaps, can see at a glance and assimilate at once, that which costs me so much time and labor, but not being able to run with the swift does not hinder my enjoyment of a walk. When you have read and thought about an article until you comprehend it, the ideas become a part of your education and stock in trade. You have wronged no one in appropriating them. They were published for the very purpose of being appropriated by the reader, and when you have incorporated them with your store of useful knowledge, you are by so much advanced in the intellectual scale.

I have no sympathy with that ambition which seeks to be thought a genius, and to know everything without having learned of any one else. All that the wisest man knows that he did not learn from, or by the aid of others, is but little in amount.

It is a great fault of our public schools and home training, that children are so crammed with memorizing, and so little taught in reasoning. It is true that reasoning depends upon the memory of facts, but a child may have forty thousand facts at command, like Webster's Dictionary, and not be able to reason with these facts, any more than a dictionary reasons.

A child's starting point in the methods of reasoning may be of great importance. I have heard Old Man Martin relate that, when he was a small boy, he and another child were separating some red and white beans that had got mixed. Each one wanted to pick out the red, and each wanted the other to take the white beans, and to settle the trouble, both with considerable warmth, appealed to a higher authority, who quietly asked what would become of the white beans if the red ones were all picked out first. After the first blush of mortification, each child was eager to answer, that the white beans would be left in the basket by themselves, and that by both picking out one kind of beans, the work would be sooner done.

This simple lesson applied to reasoning about work, said Martin, has been worth more to me than many expensive lessons.

The aversion to talking among themselves about their work, which characterizes the workmen of some shops, is one thing that prevents thinking and reasoning about work. Church and State, amusements, wages, and prices current, are all well enough in conversation, but, that work in hand must never be talked of at all, is wrong.

This reticence is sometimes cultivated by good workmen, from fear that they cannot otherwise keep ahead of their neighbors, and sometimes from mere churlishness, and the less fortunate workmen dare not open their mouths, from fear of rebuff, or of exposing their ignorance. An apprentice in such a shop has to steal his trade, if he gets it at all, and what wonder is it that some of them become thoughtless men?

For the encouragement of those who are trying to learn, and meet with such difficulties, I would say, that these difficulties are not confined to any locality, nor are they any worse now than they were twenty-five years ago.

I have known many a holiday, and some holy days to be spent in examining and sketching work, that could not be done at any other time. If a man is determined to learn, he will finally succeed in some way; but a little help sometimes goes a great ways.

During the British campaign in Egypt a ray of sunshine was reflected, as a signal, from the top of one of the pyramids near Cairo to Alexandria, about one hundred and twenty miles away. The signals had the appearance of small luminous points and were, so it is said, perfectly readable as a message from the commander of the forces.

Various Losses which Affect the Efficiency of the Steam Engine when considered as a Heat Engine.

BY ED. E. MAGOVERN.

The subject upon which this paper is written is by no means a new one to the professional engineer, or those familiar with the writings of Professor Rankine and others who have treated the subject from a thermo-dynamic point of view, and whose writings involve such intricacies as forbid their general use by all those who are not high in a mathematical sense. The object of the writer is to give in as terse a manner as possible the causes of the enormous loss in efficiency which occurs in a steam plant. By the science of thermo-dynamics we are taught that heat and mechanical energy are mutually convertible, and heat requires for its production, and produces by its disappearance, mechanical energy in the proportion of seven hundred and seventy-two foot pounds for each "British unit of heat." [The British unit of heat, so called on account of its being the standard in Great Britain, is an arbitrary term used to designate the amount of heat required to raise one pound of water (at its maximum density) one degree Fahrenheit.] Therefore, when we abstract part of the heat from a given mass, we take away part of its potential energy, or its capability of performing work; this applies to all bodies, solid, liquid and gaseous. Now let us endeavor to conform our facts just stated, to steam engine practice. We burn coal under our boilers or we abstract heat from the carboniferous matter contained in the coal, and transfer part of it to the water in the boiler; we have deprived the coal of its potential energy; this energy was manifested to us in the form of heat. Of the total energy in the coal, we receive but a part of it in the boiler, part of it has disappeared as radiant heat, and has accomplished its work by heating the air in the boiler-room; part of it has disappeared as conducted heat and has done its work in raising the temperature of the brick-work, etc., of the furnace; part of it has not been absorbed by the boiler and does its work by furthering the chimney draught. Of the total quantity of heat transmitted to the boiler, by far the greater part is used to contribute to th latent heat of the water while steam is being formed, this portion is known as the latent* heat of evaporation, and we cannot, by any means as yet devised, use this portion of our heat energy in the engine; the latent heat is given up upon the condensation of the steam, but performs no actual work in the engine. The other portion, or the sensible heat, is the form of the energy which we utilize in our engine. Now let us pass to the steam cylinder itself. The steam is admitted into the cylinder, and it then becomes the working fluid; the energy which it has absorbed, in the form of heat units from the coal, passes from a potential state into actual accomplishment of work, and the piston starts; the temperature and the pressure of the steam commence to fall and finally the steam is exhausted. Part of the heat which the steam lost has been transformed into useful work, and part has been used to raise the temperature of the cylinder, cylinder-head and piston. Let us look further into this matter of the passage of the heat without doing useful work. Suppose we take a cylinder, cutting off say, at one-fourth, and further let us suppose that the instant the valve closes the part of the cylinder exposed by the piston is filled with perfectly dry steam. Now the expansion commences, and during that operation the temperature of the walls surrounding the fluid must be of the same, or nearly the same temperature, as the fluid itself. [Were the contact between the fluid and the walls of sufficient duration, the temperatures would have to be the same; hence it follows, the shorter the time of contact between the steam and cylinder surfaces the less the passage of heat between them and the greater the difference in temperature.] In other words, upon the admission of the steam to the cylinder it raises the temperature of the metallic surfaces to approximately its temperature; expansion then takes place, the steam continually losing its heat as it does work; it strives to make good that loss of heat by abstracting heat from the walls of the cylinder. This heat lost by the cylinder walls must evidently be recovered when the piston commences its stroke. How is it recovered? It is recovered at the expense of the entering steam falling upon these chilled surfaces, condensation takes place, and now we have a mixture of steam and water in our cylinder in place of live steam.† In the forward motion of the piston, new, cold surfaces are met, and further condensation occurs. This is the manner in which a great loss occurs in steam engine practice, and together with loss by re-evaporation [nearly always occurring where large initial condensation appears] forms a serious financial detriment to economical engineering. In order to show how great this loss may be, the writer quotes from a pamphlet‡ by an eminent authority on these questions:

"Heat is constantly transferred from the steam to the exhaust side, and, doing almost no work, is wasted, and the efficiency of the engine and the cost of fuel are greatly affected. The heat thus lost frequently amounts to 25 per cent. of the total supplied, and has been known not infrequently to amount to 50 per cent. In one case noted by the writer initial condensation was as high, *at least*, as 80 per cent."

Many expedients have been resorted to with a view to overcoming this difficulty, among which are superheating the steam, or in other words of introducing in the fluid more heat than that due its pressure; this resort is sometimes very efficient in checking the evil, but certain practical difficulties, such as burning out of packing, &c., seriously hamper its usefulness. Steam jacketing, or surrounding the working cylinder with live steam from the boiler, is also practiced, designed to prevent these losses; the benefit arising from this practice is limited by the fact that re-evaporation is furthered by jacketing and the gain in prevention of cylinder condensation is mitigated by the frequent furthering of evaporation. The last expedient I shall mention is that of prevention as far as possible of loss of heat by radiation from the cylinder by lagging with some non-conducting material, and by employing a high rate of piston-speed, so as to make the time of contact between the steam and cylinder a minimum.

[NOTE.—The evil in question may doubtlessly be counteracted in a measure by the alteration of the dimensions now common in

stationary engine practice; that is to say, to make the bore greater and the stroke shorter, so as to obtain the minimum of surface with the maximum of volume.]

* Rankine defines the latent heat of evaporation as that heat which does not raise the temperature of the substance, but disappears in causing it to assume the gaseous state. (Steam Engine and Prime Movers, page 252, article 214.)

Now commonly accepted theory believes that this latent heat of evaporation furnishes the energy required to overcome the strong molecular forces which serve to hold water as a liquid; and upon the partial destruction of these forces, the force of repulsion acts to disperse the molecules and we have our liquid water transformed into gaseous steam.

† This is true, providing, as is usually the case, the steam be not superheated. If superheating be employed, we check the loss by using sufficient heat in the steam to allow the surfaces to absorb the required quantity of heat without producing condensation in the fluid.

‡ On the "Ratio of Expansion at Maximum Efficiency," by Prof. R. H. Thurston, *Jour. Frank. Inst.*, May, 1881.

How to Make a T Square.

BY JOE V. MEIGS.

I have noticed with pleasure the matter which you have introduced in your paper in the furtherance of the education of the young mechanics growing up among us.

I have myself, devoted some attention to the subject of drawing, and I send you a sketch of a T square that I have invented, not for the purpose of emblazoning my name in connection with it, but for the purpose of its being described so that the young mechanic may, without much labor, make an accurate and perfect T square.

Some of the T squares that have been described are, comparatively speaking, of no account whatever, because there is no adjustability. I want to demonstrate how easily one can be made after the plan which I submit.

Fig. 1 is a sketch of the end of a piece of wood, to show how the grain of the wood ought to run which is selected to make the blade. It will be noticed that the grain runs crosswise. The line *A B* shows the piece which is to be sawed off and planed truly on its edges *A B* and *E D*. Then after that has been made rectangular of the required length for the blade, let as many pieces be sawed off as are required for the number of plates desired, in the direction of the lines *E A*. These pieces are to be used as blades. That presents the wood in a way that will be less affected by the weather, and represents the experience of an old pattern maker.

Fig. 2 is a drawing of the face, cross-section and edge of the blade, and will be readily understood without further explanation.

Fig. 3 is a short piece of wood to go on the under side of the head of the square as a binder. It is used as shown in the dotted lines in the sketch Fig. 5, and is marked *A* in Fig. 6.

Fig. 5 shows the square as put together, and Fig. 6 is an edge view.

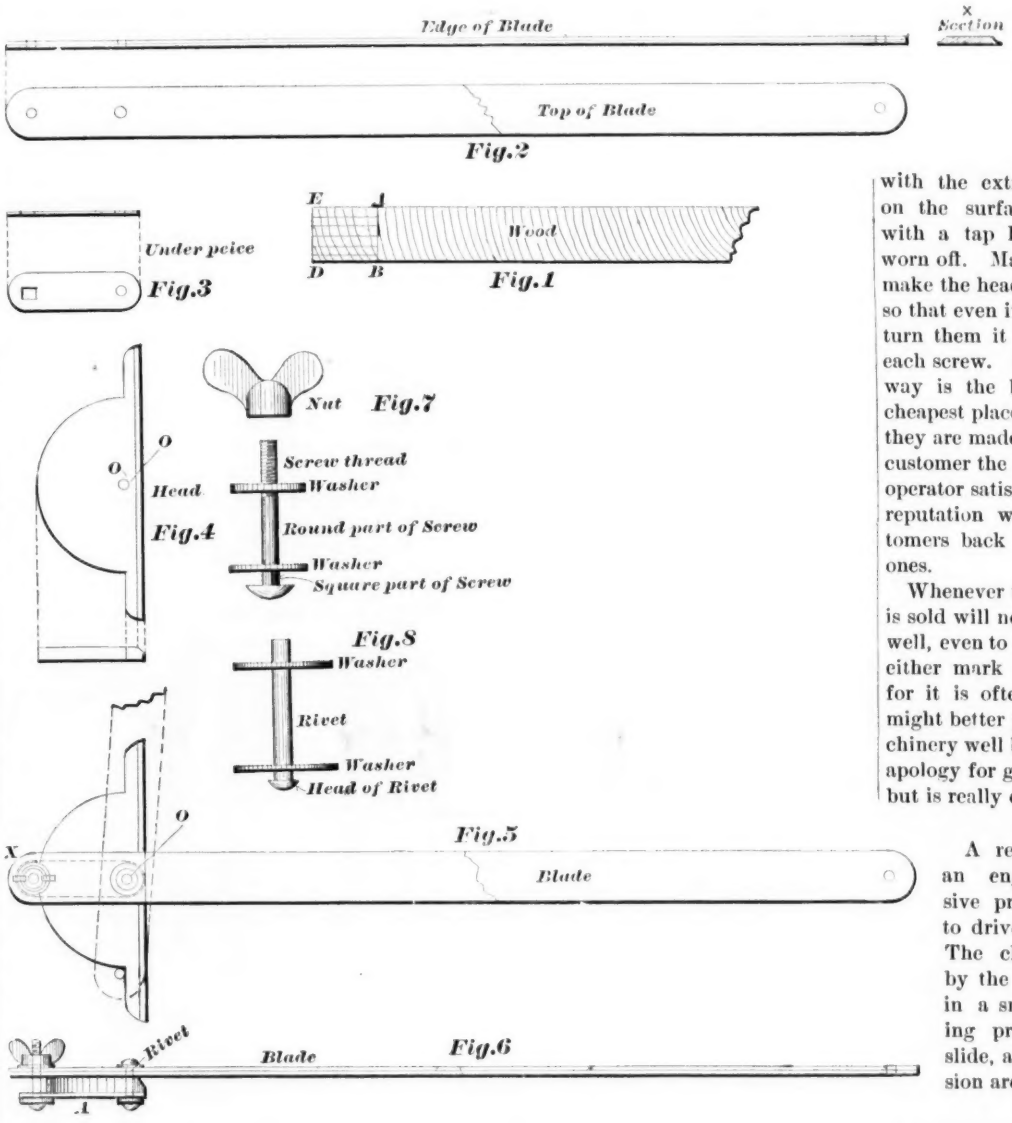
Fig. 4 represents the head of the square, which is 12 inches on its front face. The upper edge, or edge next the square, is scarfed, so that if the drawing-board should be jammed at its upper edges it will not disturb the true meetings of the face of the square and the board.

The two ends of the head of the square project two inches, and are about ¾ of an inch wide. The head is ½ thick, and is cut round on its back side, as represented in the drawings. The square is pivoted at the pivotal center of the round part of the head, and a distance from the face of the head, less by about ½ inch than one-half the width of the blade. The blade, when pivoted at *O*, projects about one inch beyond the edge of the round part, as at *X*, so that the under piece, marked *A*, in Fig. 6, can have the screw, Fig. 7 in detail, pass through between the two pieces, grasping the head, so that the slightest turn of the screw will fasten the blade immovably. The slightest reverse turn, loosening the screw, will also enable you to place the blade parallel with the front face of the board, if desired, or at any angle desired, as shown by dotted lines in Fig. 5—an advantage of great importance.

Fig. 8 represents the pivot, and may be nothing but a rivet suitable for the thickness of the material which has been selected.

It will readily be seen that no great accuracy is necessary in constructing the square, except that the faces of the blades shall be parallel to each other, and even that is not absolutely requisite, if the faces are straight; also that the front face of the head shall be straight.

I do not waive my right to patent this square, because I do not want some unprincipled person to patent it, and therefore I shall take advantage of my rights, if it becomes necessary. It is at the service of the craft, but is not at the service of the trade.



Little Things.

BY S. W. GOODYEAR.

Among all the discussion of mechanical subjects, has sufficient attention been paid to the "little things," which in their observance, or omission, have so great an influence on the correct performance of duties expected of machinery?

The little things which go to make up the sum total of bad work in screw-fitting would furnish material, not simply for a newspaper article, but for volumes. How often, in the commencement of running a new machine, are screws, which need to be removed, found to go so hard as to require all the strength which can be brought to bear upon a wrench to turn them? Of what use is it to tell the operator to turn such screws in, till he can feel that they are "just up?"

Then there are the abominable holes which were tapped with tapering taps, or with bottoming taps having the threads so worn toward the end that no straight screw can fit the holes tapped with them. Who that has operated machinery cannot vouch for the description of this variety of fit, when we say that it is frequently the case that a screw goes so loose for the first few threads as to hardly require turning; the external and internal threads will almost slip past each other; and still, before the screw is nearly to its place, it is difficult to turn it at all? Of what use to talk about the "hold in the iron" which such screws have, when the fact is that, no matter how deep the hole may be, all the hold that the screw has in it is with a few threads at the extreme end, and those threads out of all decent shape? These are the screws that break off way down in the hole, and the piece in the bottom has to be drilled out.

Another variety of holes are those from which the tapping chips were not removed, the result being that the first time the operator attempts to turn the screw back to place (which was easily unscrewed) he finds it beginning to go hard before it is nearly up; a turn or two more and the screw will go no further. With difficulty it is started back, and on removal it is found that several threads have been torn off, and the thread in the hole correspondingly injured. An attempt to clean out the hole brings out plenty of chips, and again the screw is turned in part way; it won't go; some of the chips, with the torn-off edges of the thread from the screw, have been forced into the iron at the bottom of the thread in the hole; more time spent in trying to pick them out. If he only had a tap of the right size and pitch! A search is made, but no tap can be found; so plenty of oil is used, and the screw is forced in.

No little annoyance and extra expense are caused by not marking screws to their places. Of course, the operator should, in taking out the screws, lay them so that he will know, regardless of any mark, where each belongs; but even if he does this, they are liable to get mixed by accident, or by some assistant, who, to any remonstrance, replies: "What's the odds?—they're all alike." With a dozen screws on which to ring the changes, which were fitted by the forcing-in process, some of them originally having a thread cut at an angle too obtuse to match the thread in the hole, others cut at an angle too acute, and possibly all of them with a leaning thread—some in one direction, others in the opposite—it will probably take longer to find the right place for a single screw than to screw the entire dozen to their places if they had been marked. "All alike; no need of marking." Humph. Nothing could be more unlike. In screwing in such screws each one is not only changed in its own shape of thread, but it changes the shape of thread in the hole; having conformed to each other, they should not be again changed.

Who says that these things are too *little* to talk about? Why, my dear sir, for the saving of the few cents additional which it would cost the builder of machinery to have screws properly fitted, dollars—hundreds of them, aggregating millions of dollars yearly—are wasted. Time is money, and, with millions of screws to be turned in and out, it is a matter of importance that it be done in the least time possible, and that serious damage to machinery by the breaking or stripping of imperfect screws be avoided.

Moral: throw away all old taps that have become dulled by use, and provide means, and insist upon their being used, for grinding threading tools to a proper angle. Give up the belief that a screw fits because it goes in hard, unless you know that it is not simply bearing with the extreme edge of a sharp thread on the surface left by tapping the hole with a tap having the top of its thread worn off. Mark all screws to their places; make the heads of screws of same size alike, so that even if a monkey-wrench is used to turn them it will not need readjusting for each screw. Clean out the hole. The right way is the best for all concerned. The cheapest place to fix "little things" is where they are made. To do work right gives the customer the worth of his money—gives the operator satisfaction, and gives the builder a reputation which not only brings his customers back to him, but brings him new ones.

Whenever the price at which any machine is sold will not warrant doing all the work well, even to the "little things," it is time to either mark up the price or stop building, for it is often the case that the purchaser might better pay two or three prices for machinery well built than to have the miserable apology for good work which is called cheap, but is really dear at any price.

A recent German invention is of an engine in which the explosive property of gunpowder is made to drive the piston back and forth. The charges of powder are ignited by the motion of the piston drawing in a small flame through an opening provided by the motion of a slide, and the products of the explosion are discharged by a slide.

LETTERS FROM PRACTICAL MEN.

Shrink Fits.

Editor American Machinist:

The article on "Shrink Fits," by F. H. Richards, which appeared in your valuable paper of Oct. 28th, has moved me to add a few words in relation to the same subject.

It is a common practice in some shops to cool the parts as soon as possible after the adjustment has been perfected. In fact, from the way in which cold water is used, one would be led to suppose that a successful job depended on the haste with which the temperature of the metal is reduced.

This I hold to be an error. Let us take, for instance, a wrought-iron band to be shrunk on the hub of a pulley.

The band is expanded to a size that will allow it to be placed in proper position, and when it is properly adjusted we cool off with water. What is the result? The iron at the periphery of the band is contracted, leaving a mass of metal in the center still expanded, thereby causing unequal contraction and unnecessary strain on the surrounding metal. I believe if this matter is looked into that so many of the failures in this line can be acounted for.

The subject is one which, like all others, has two sides for discussion, and perhaps others of your readers beside myself would be glad to hear more about "shrink fits."

W. H. J.

Dog for Milling Machine.

Editor American Machinist:

I enclose a sketch of a dog for use on planer, shaper, or milling machine centers, which is new to me, and is a very convenient tool. The convenient feature is that the same distance is always retained from the center of the work, or mandrel, to the tail of the dog, by means of the three set screws, by which the work is always held central in the dog. The device on a planer center for securing the dog is generally a fixed distance from the center, and with this tool, for the different sizes of work, the tail will always come in the same place.

The body of the dog, *B*, is made of wrought iron or steel, with three set screws equally divided, and has a lug, of proper distance from the center to suit the centers it may be made for, with a hole bored through it of suitable size to receive the tail *A* (which is a piece of turned steel flattened on one end). The metal is sawed through from this hole to the center or large hole of the dog, and a screw used between the two for the purpose of clamping the tail, as will be readily seen by the sketch.

By this separate or adjustable tail, the flat part of it can be turned to suit the clamping device on center, and can also be made long or short, by moving it back and forth, to suit the work. Or, if required, two separate tails can be made—one long and one short one.

The user of this dog, for the purpose named, will find it very convenient. It is also easily made. The device is new to me, and I offer it thinking it may be of benefit to others.

Waynesboro, Pa. A. B. LANDIS.

Patching Fire-Boxes.

Editor American Machinist:

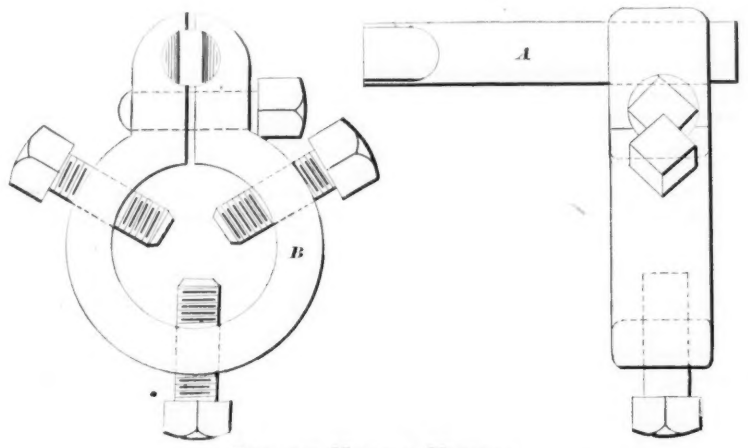
Happening not long since to see a couple of boiler makers deliberately, that is, with plenty of time to spare, *repairing* the fire-box of a boiler by putting on a soft patch with about a pound of putty under it, led to some philosophizing on the subject of fire-box patches in general, and particularly as to where a boiler maker ever found sufficient inducemeut for inventing such a thing as a soft patch. Every one who knows anything about the matter knows that a patch plastered up with putty was never tight, in the fire-box of a boiler under steam, and ought to know that if suffered to remain for any length of time it is a source of danger, from the iron wasting and corroding away, making it liable to let go at any time under the persuasion of a little extra pressure.

Let it be admitted that a soft patch ought never to be used, and still there are good and bad ways to patch the fire-box of a boiler. No boiler maker considers a rivet of any account, whether it shows a leak or not, unless it fills the rivet hole, and yet it is not often that a patch bolt makes any sort of decent pretentions to filling the hole in the patch. It ought to fill it, and it may be about as readily made to do so as to be made the standard $\frac{1}{16}''$ loose, with filing at will; but it don't.

Another thing about a patch bolt, as ordinarily used, is the destroying in a great degree of the holding qualities of the head by bending it against the rough, out-of-line surface of the patch, in screwing up, and finally concluding the destroying process by calking the head to make it tight.

The accompanying sketch represents (about one-half size for ordinary purposes) a useful tool for putting on bolt patches, for which novelty in its general features is not claimed, but which some experience leads the writer to believe might profitably be better known and oftener used than it is. In the sketch, *F* is intended to represent the damaged sheet, and *H* the patch. It is understood, of course, that the damaged part of the sheet is to be cut out the same as for riveting. The patch being accurately fitted, holes should be drilled in the patch as if they were to be tapped for the patch bolt. A suitable number of holes (usually three or four will be sufficient) should be marked and drilled and tapped in the sheet for temporary bolts one size smaller than the patch bolts, and with these the patch should be bolted in place. The rest of the holes can then be drilled in the sheet for tapping, the holes in the patch serving to guide the drill in the sheet, thus providing for the perfect alignment of the holes in the two parts.

The holes should then be enlarged in the patch, by the use of a tit drill, to the size of the body of the bolt, or so that the bolt will just turn in the hole, and the holes tapped in the sheet with the patch in place. Three



DOG FOR MILLING MACHINE.

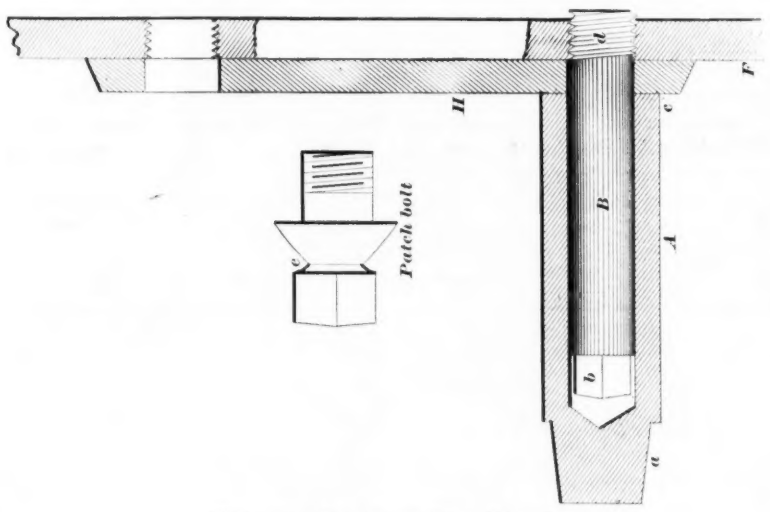
or four bolts can then be inserted, the temporary bolts removed, and the holes they occupy enlarged and tapped.

Should still greater accuracy than can be secured in this way be desired, the holes in the patch can be enlarged with the tit-drill to within $\frac{1}{64}''$, or less, of the size of the bolt, and then the last tap can be made with the body just above the thread fashioned to cut like a reamer. By this means almost absolute truth can be secured. With reasonable care, however, this latter plan will hardly be necessary.

The tool for squaring the patch around the hole is shown at *A*, in position for use. *B* is a steel stud, the thread, *d*, of which fits snugly in the holes tapped in the sheet. The outer end, *a*, of the shell *A* is squared, or otherwise fitted to a ratchet wrench. The hole in this shell is made to fit accurately the stud *B*, and the end at *c* is made with teeth like a face mill. It will be evident that by the use of this tool the patch may be squared up around the holes so that the head of the bolt will seat evenly without bending, and will be tight without calking; also that the body of the bolt may be made to fill the hole in the patch without friction or straining in screwing it up.

The patch bolts should be nicked under the head with the cutting-off tool in making (as at *e* in the sketch), to insure their twisting off there sooner than in the thread. They should be screwed up evenly, and none of them twisted off until all are properly seated.

A good size for patch bolts for $\frac{5}{16}''$ and $\frac{3}{8}''$ iron is $\frac{3}{4}''$, and a good thread 14 to the inch. A patch put on in this way can be as securely calked as if riveted, and can be depended upon for present satisfaction and future usefulness. I am aware that some have a preference for a countersink head patch bolt, but experience with cone-headed bolts in the fire boxes of locomotive boilers leads to the belief that when properly applied there is no more trouble from them than from an ordinary rivet head. It costs a trifle—not much—more to put on a patch in this way than in several other ways that might be mentioned, but the job has the merit of being worth something. FRANK GLEASON.



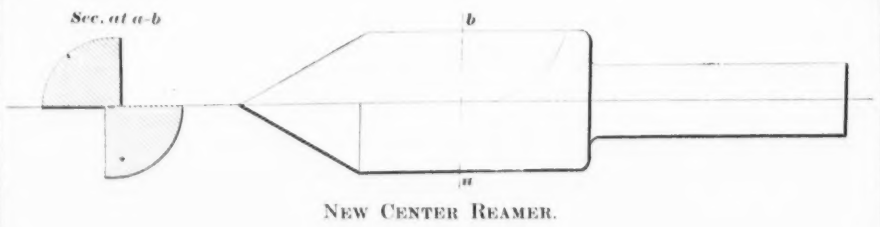
TOOL FOR PATCHING FIRE BOXES.

A New Center Reamer—Coarse or Fine Feed.

Editor American Machinist:

I have been a constant reader of your valuable paper for three years, and have been deeply interested in the discussions carried on in its pages, and also have noticed your willingness to give anybody a chance who has something of interest to say.

I herewith send you a sketch of a center reamer, which I think better than any you have yet published. In the first place it has



NEW CENTER REAMER.

plenty of room for the chips to escape; next after being once made right, it is easy to keep at the right angle by grinding, and if ground properly it will not chatter. If it should get broken it is easily ground to shape. The sketch will explain itself.

Your correspondents "Veteran" and "Fine Feed" do not give each other fair play; for instance, "Fine-feed" asks, "how will you remedy the spring of a tool in boring a hole 10″ long?" Such a hole may be bored quicker and better in some other way; for instance, with a boring bar, where you may take as large a cut, or as coarse a feed as you desire. On the other hand, if I were turning up small work, drop forgings or small tool work for instance, where there is very little material to remove, I would use fine feed and fast speed. The only way to make time on a job is to use judgment in reference to the speed and feed, as well as to everything else connected with it. JUSTITIA.

Steam Engine Economy Practically Considered.

Editor American Machinist:

If users and owners of steam engines would require the engine makers to make and warrant their engines to furnish an indicated horse power per hour on a consumption of two or three pounds of coal, the engine builders would very soon find a way to make their engines meet the demand. But owners and users of engines generally, when buying, look more to the first cost of the engine than they do to the every-day cost.

For instance, purchaser No. 1 wants an engine and boiler of 100-horse power. He visits different establishments where engines and boilers are made, and states his demand for an engine that will run, and he wants it for a little money. He finds them of the size he wants at prices from $1,000 to $2,500. Some are fine engines, nicely finished and expensive, while others are very plain and cheap. The builders try to explain to him the merits of the different engines they make, and they will always say that the highest-priced engines are the best, and that they will give the best satisfaction to all, as the best engines cost the most at first, but are the cheapest to run. But the purchaser says he does not want a high-priced engine, and as for finished work he does not want that at all, for he is going to put the engine in some dark out-of-the-way place by the side of the boiler and coal bin, where it will be covered with coal dust and ashes most of the time. His man, that he calls an engineer, will have all he can do to shovel coal and ashes, and do other chores outside of the engine room, without spending time keeping an engine bright. The cheap engine is bought and set up, on a cheap but miserable foundation. The holding-down bolts reach through one or two courses of brick only, when they should go to the bottom of foundation to get a strong hold. The connections are made with the boiler, etc. (This work most likely is done by laborers, with the owner of the engine bossing the job.)

After the engine has been running a short time the owner begins to show signs of uneasiness. The engine is shaking on its foundation, and it does not come up to his expectations in the amount of power actually furnished. It pounds and thumps, runs hot in spite of oil, and is getting away with his coal pile too fast. He blames his man for tinkering with the engine, and says somebody is stealing his coal.

The cheap man knows no more about fixing an engine than he does about firing, or keeping steam. A sample of his firing may be seen in the half-dozen shovels which he has split up to the handles by striking them against the furnace doorway. He shovels coal when he ought not to; has steam blowing from safety valve one minute, and furnace door wide open the next to cool her off. And again feeding water to the boiler full head to cool it, or else letting the water run low to raise steam.

As for oiling the engine he does it with a rush, for he hasn't much time and not much light, so he squirts oil anywhere from the rim of the fly-wheel to the exhaust pipe, but rarely hits an oil cup or oil hole. So the oil is wasted, the engine runs hot, and he says the oil isn't good for anything. During the year that the engine has been running it has been stopped several times for repairs.

Finally the proprietor gets an engineer to test his engine by applying the indicator. He finds his 100-horse power engine is in fact only an 80-horse power engine. He also finds that it costs 10 lbs. of coal per horse power per hour to run it. Some of the causes for such a waste of fuel may be bad

valve adjustment. The steam ports or the steam pipe may be too small; or a small choked exhaust, causing back pressure; or it may have a throttling governor, one of those nice ones that squeeze the steam through a small space. Any of the above are good causes for wasting fuel, and are very often found in a greater or less degree in engines. As a natural consequence the purchaser is continually finding fault with the engine builder for selling him such a machine.

Some of the readers of the AMERICAN MACHINIST may say this is an exceptional case. Far from it. There are many engines and boilers in operation that require more than 10 lbs. of coal per horse power, and yet the owners of them never think they can economize in any way except to cut down the pay of some one.

At another time I may tell how user No. 2 buys his engine and boiler.

STARTING BAR.

Corning, New York, Oct., 1882.

Lathes and Lathe Work.

Editor American Machinist:

In your issue of Oct. 28, "Fine Feed" seems to think I advocate the use of coarse feed and slow speed for everything. Nothing of the sort. I do not expect turners of cotton machinery to use the same methods as those who turn heavy marine work. There are many lathe hands brought up on light "fiddle," or skeleton constructed lathes, who, when put on a stiff one, provided with double tool holders, still persist in using a small round tool for boring large holes. It is poor practice to bore a small hole ten inches long with a small tool held in the tool holder.

In large shops where cotton machinery and like work is made, there is a great division of labor; one wheel or pulley goes through a great many different hands. For instance: the boring is all done in one department. Self-acting boring lathes are used, and all work is bored exact to standard templates. It is needless to go into details here about the shape of the drills and bits; suffice it to say the holes are not turned out with small, springy tools.

The next process the wheels for such work undergo is to be driven on a steel mandrel with hardened ends, and "roughed out," or in other words, have a cut taken all over them on a slide lathe by a boy.

In the third process they are taken to a man on a hand lathe, who scrapes them all over with scrapers about $\frac{1}{8}$" thick. Now these men, from long practice, become very quick and dextrous in the use of scrapers. Special grindstones are sometimes provided, two stones revolving together to keep each other perfectly true and flat, so that a first-class cutting edge can be kept on the tools. A first-class hand turner will go all over a piece of work of irregular form, composed of bulges and hollows, without having to use a piece of sandstone or a file, and not a ridge or lump will be found, and no chattering.

In the fourth process the wheels are taken to the polishing lathe, where they are polished with oil and emery in the usual way by a laborer, the lathe being driven at very quick speed.

The most particular part of the work is the chucking and boring. A first-class borer will bore holes exact to template, with flat drills, and make beautiful holes; in chucking on the face plate, from long practice, he will chuck work by the eye, without the use of chalk; using bolts and clamps on the outside of the circle, and setting with a few taps of a hammer.

The object in dividing the work in this way is to get more and better work done, and partly to keep skilled workmen on the best part of the work, apprentices on the poorer part; also not to abuse good slide rests and lathes by scraping and polishing on them.

How beautifully the last cut is taken on some of the work from the crack tool shops of Philadelphia! The coarse feed is distinctly visible to the eye, and perfectly smooth to the feeling. There was a heavy machine from Philadelphia sent here last summer; all wheels, etc., were beautifully finished with plain fillets and rounded internal and external corners, and all the heavy unpolished parts were finished with a flat tool, and a feed of either two or four to the inch.

I saw by your journal that since a manufacturer's hand lathes had been illustrated in the AMERICAN MACHINIST, he had sold 80. I am glad to hear that there are still shops where a man that can use hand tools is appreciated. A man that can use hand tools has a great advantage, on some jobs, over a file rasper.

It is bad policy in a machine shop to have the lathes all of one type. Special lathes for special work is the best plan.

I once showed a New Hampshire man a Massachusetts machine, where the feed used was so fine that it was impossible to see it without the aid of a microscope. He said the reason for this was that the practice there was to run two or three machines, and it was impossible for a man to work them up to their full capacity, so they "killed time on them."

As regards the number of feet per minute in cutting iron, a great deal depends on the hardness of the metal. If a man can take a heavy cut on iron at 12 to the inch, it is obvious that to get over the ground in the same time with a feed of 24 to the inch the machine must be run at double the speed.

There are certain angles and clearances for tools to cut properly and preserve their edge which cannot be departed from, and bad grinding means bad work. A great deal of bad grinding is done by men who have not been accustomed to hold their tools firmly on an iron rest on the front of the stone. What is more disgusting than to see a man on a lathe begin with a new tool of the proper shape, and after a few days' use leave it out of all decent shape.

I was much pleased with "Shop Kinks," by Lewis F. Lyne, in your issue of Oct. 28. His article on lathe centers and center reamers ought to be hung up in every shop in the United States. Fig. 8, from life, showed the detestable practice of not having the center fit the countersink. Good centers are the foundations of good work, and all centers in a machine shop ought to agree. The idea of turning cast iron taper plugs, with the tail block set over, on prick-punched centers, is preposterous.

Out of Mr. Lyne's twelve cuts of different center reamers, the half round is the quickest and cleanest cutter. The only drawback is the point losing its sharpness and getting below the center. The small hole in steel should be drilled first. Why could not a hydraulic machine be made to center both ends at once, by pressure? I turned two centers twenty years ago for an old car-wheel press for axles, and although hundreds of axles have been centered by them, they are still in good order and do not show a particle of wear. The axle is placed on four rollers and turned around and marked with a pointer on the ends, then punched with center punch, and taken to the press and put between the centers. If the axle should happen to run out of truth, the center is chipped on the full side with a half round cape chisel and the pressure again applied. The centers will be found perfectly smooth and hard, and will wear better with less oil than reamed centers. They can be pressed to $\frac{5}{8}$ or $\frac{3}{4}$ drain, which is large enough for heavy cutting. In this way two laborers will do more work in one hour than one machinist will, in the lathe, in four.

Fort Wayne, Ind. VETERAN.

Machine Tool-Builders.

We publish this week a list of the machine tool builders of the United States, one hundred and thirty-two in number. In making up the list, we have endeavored to include all the manufacturers of engine lathes, upright drills, iron planers, shapers, gear cutters, slotters, boring mills, milling machines, centering machines, and cutting-off machines. We have not included the manufacturers of bolt-cutting and nut-tapping machinery, who do not also make any of the machines enumerated, for the reason that our information concerning their number and whereabouts is not complete. Although we have given much careful attention to the compilation of this list (having the best facilities for doing it), it may be that some machine tool builder is left out. If so, we should be glad to have the name and address sent us, that we may publish the addition. A very few of the establishments here named have not yet placed any tools upon the market, but are constructing tools with the intention of soon supplying orders. In some instances, where the party named builds but one class of machine tools, the special kind is named.

In our issue of June 28th, 1879, we published a list of machine tool builders then in business. There were forty-six then, only five of whom have since gone out of the business. Never before were so many machine tool builders in the market, and never before were first-class tools so well appreciated. The demand for good tools must extend as new manufacturing enterprises are started. Not a week passes that we do not record in our department of "Manufactures" the erection or starting of some new establishment requiring machine tools.

GROSS, SHAW & CO.....Auburn, Me.
FARREL FOUNDRY & MACHINE CO., Ansonia, Conn.
BATTLE CREEK MACHINERY CO., Battle Creek, Mich.
W. W. OLIVER (Drills).....Buffalo, N. Y.
WHITMORE & SHOEMAKER (Drills)..... " "
WARREN HASKELL & CO. (Centering Machines).....Boston, Mass.
AMMIDOWN & HONEYCOMB (Drills)..... " "
AMERICAN TOOL & MACHINE CO..... " "
BRIDGEPORT MACHINE TOOL WORKS (E. P. Bullard).....Bridgeport, Conn.
WALTER BROS..... " "
JEROME B. SECOR..... " "
JOHN H. WRIGHT..... " "
E. W. BLISS.....Brooklyn, N. Y.
PROGRESS MACHINE WORKS (Jackson & Tyler).....Baltimore, Md.
J. S. DETRICK (Planers)..... " "
CLINTON MACHINE CO. (J. Hammond Gray), Camden, N. J.
J. F. BLAIR (Lathes)..... " "
SWEETZER & MERRITT (Drills), Brockton, Mass.
GODDARD, SHAW & CO..... " "
EBERSOLE & KAILEY (Milling Machines), Canton, O.
JOHN STEPTOE & CO.....Cincinnati, O.
MCFARLAN & NOTTINGHAM... " "
LODGE, BARKER & CO..... " "
GEO. A. GRAY, JR., & CO..... " "
H. BICKFORD (Drills)..... " "
H. L. SHEPARD & CO (Lathes). " "
QUEEN CITY MACHINE WORKS (Reinshagen & Buckman)... " "
WARNER & SWASEY.....Cleveland, O.
JAMES AITCHISON ..... " "
W. R. EYNON & SONS..... " "
AMES MANUFACTURING CO..Chicopee, Mass.
MCFARREN, LEVY & CO.....Chicago, Ill.
DURKEE & DOE..... " "
COLUMBIA IRON FOUNDRY & MACHINE TOOL WORKS..... " "
WARREN SPRINGER (Drills).... " "
CHICAGO LATHE CO. (Lathes)... " "
CHRISTIANA MACHINE CO. (Boring Mills), Christiana, Pa.
JOSEPH B. REED (Lathes) .....Cairo, Ill.
R. A. BELDEN & CO.....Danbury, Conn.
FAY & SCOTT.....Dexter, Me.
PUTNAM MACHINE CO. ...Fitchburg, Mass.
FITCHBURG MACHINE WORKS, Fitchburg, Mass.
PUTNAM TOOL CO..... " "
GRANT & BOGERT.....Flushing, N. Y.
A GOMERSALL (Lathes)....Germantown, Pa.
GLOUCESTER MACHINE WORKS, Gloucester City, N. J.
WELLS BROTHERS..... Greenfield, Mass.
MICHIGAN TOOL WORKS (Lathes), Grand Rapids, Mich.
THE PRATT & WHITNEY CO., Hartford, Conn.
DWIGHT SLATE..... " "
NILES TOOL WORKS.....Hamilton, O.
BRAINARD MILLING MACHINE CO., Hyde Park, Mass.
PORTER MAN'F'G CO.....Hatfield, Mass.
GEORGE W. FIFIELD (Lathes). Lowell, Mass.
BENJAMIN LAWRENCE..... " "
F. W. PERKINS (Lathes).....Lowell, Mass.
LAMBERTVILLE IRON WORKS, Lambertville, N. J.
PARKER BROTHERS (Planers), Meriden, Conn.
FLATHER & CO.....Nashua, N. H.
GEORGE H. WHITNEY..... " "
GEO. W. DAVIS & S. A. DAVIS, Nashua, N. H.
E. E. GARVIN & CO.....New York.
PEERLESS PUNCH & SHEAR CO. (Drills), New York.
FRANK THOMPSON (Lathes)..... "
HEWES & PHILLIPS IRON WORKS, Newark, N. J.
E. GOULD & EBERHARDT.... " "
WATTS, CAMPBELL & CO. (Boring Mills) ..... " "
GEORGE A. OHL & CO. (Lathes) " "
A. ALEX. POOL & CO. (Milling Machines)..... " "
NEW HAVEN M'F'G CO...New Haven, Conn
F. C. & A. E. ROWLAND (Lathes)..... " "
W. P. DAVIS (Drills), North Bloomfield, N. Y.
BROWN & SHARPE M'F'G CO., Providence, R. I.
STAR TOOL CO..... " "
WM. SELLERS & CO.....Philadelphia, Pa.
WM. B. BEMENT & SON... " "
MACHINE TOOL WORKS (F. B. Miles).... ..... " "
ED. HARRINGTON & SON.. " "
ISRAEL H. JOHNSON, JR., & CO..... " "
GEORGE C. HOWARD..... " "
ROBERT BISHOP..... " "
NEWTON MACHINE TOOL WORKS (C. C. Newton).. " "
ALFRED BOX & CO. (Drills) " "
RIEHLE BROTHERS..... " "
FLANDERS MACHINE WORKS (Pedrick & Ayer..... " "
HOBBS & HARRINGTON (Drills)..... " "
WILSON & SHUGART..... " "
THORNE, DE HAVEN & CO. " "
WALKER BROTHERS (Planers)..... " "
MOORE HALL FOUNDRY & MACHINE CO., Phœnixville, Pa.
HICKENDORN & WILHELM.....Reading, Pa.
F. P. MICHEL.....Rochester, N. Y.
W. GLEASON..... " "
GEO. E. BRETTELLE..... " "
W. F. & JOHN BARNES.....Rockford, Ill.
E. S. STACY (Drills).....Springfield, Mass.
DAVIS TOOL & LEVEL CO. (Planers)..... " "
W. F. C. RIDER...South Newmarket, N. H.
H. B. SMITH MACHINE CO..Smithville, N. J.
SAN FRANCISCO TOOL CO., San Francisco, Cal.
C. E. LIPE (Milling Machines), Syracuse, N. Y.
HENDEY MACHINE CO....Torrington, Conn.
S. ASHTON HAND.....Toughkenamon, Pa.
AMERICAN WATCH TOOL CO., Waltham, Mass.
A. M. WHITE & SON.....Waterbury, Conn.
BLAKE & JOHNSON ..... " "
GAYLORD CROSS & SPEIR CO..... " "
GEORGE GAGE.....Waterford, N. Y.
NATIONAL TOOL CO.....Williamsport, Pa.
D. E. WHITON.....West Stafford, Conn.
BETTS MACHINE CO.....Wilmington, Del.
HILLES & JONES..... " "
JONES & LAMSON MACHINE CO., Windsor, Vt.
DAVID W. POND.....Worcester, Mass.
P. BLAISDELL & CO..... " "
LATHE & MORSE TOOL CO. " "
WHITCOMB MANU'F'G CO., (Planers)..... " "
PRENTICE BROTHERS.... . " "
F. E. REED..... " "
MCMAHON & CARVER..... " "
BANCROFT & SMITH, (Planers) " "
A. M. POWELL & CO..... " "
H. C. PEASE & CO. (Planers) " "
WM. H. WARREN..... " "
BOYNTON & PLUMMER..... " "
W. H. EDDY .... " "
W. C. YOUNG & CO..... " "
J. A. FULLER & CO. Lathes) " "
J. A. SAWYER & SON, (Planers) " "
J. S. WHEELER & CO..... " "
WORCESTER FREE INSTITUTE " "
L. H. FAIRBANKS (Lathes). " "

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NEW YORK, NOV. 11, 1882.

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"The National Association of Stationary Engineers."

For the first time in this country an association has been formed of the local societies of stationary engineers. In answer to the call which was published in our columns two or three weeks ago, delegates assembled in Pythagoras Hall, New York City, October 25th, and formally instituted the National Association of Stationary Engineers, which is likely to attain an important position among the engineers' societies of this country. Among the delegates present were: Henry D. Cozens and Horace E. Chadwick, Providence, R. I.; Arthur G. Hounsell, New York City; James Canning, Brooklyn, N.Y.; George M. Barker and George A. Grover, Boston, Mass.; James G. Beckerleg, Chicago, Ill.; N. W. Williams, Philadelphia, Pa.; J. F. R. Cullinan (by E P. Watson, proxy), Rochester, N. Y.; Charles Hare, Lynn, Mass.; A. M. Davy, Detroit, Mich.; W. L. Parsons, Springfield, Mass.; Isaac H. Baker, Wilmington, Del.

Mr. Cozens, of the Rhode Island Engineers' Association, being chosen chairman, made a brief but pointed address. "You must admit," said he, "that the most essential factor in the organization of this association is that of self-improvement, and that this is the first step to greater confidence and higher respect on the part of employers. No man is worthy of respect who either joins in person or by his connections and sympathies with strikes. The engineers of this association should hold by merit the respect and confidence of their employers. Let every man work for himself, doing his level best for his employers; and, if one man is careless and reckless, while another is careful and attentive, in due time they will both receive their award. The engineer who leaves his situation without sufficient notice to allow his employers to procure a substitute should be expelled from his society, and notice of that fact should be sent to his employers and every society of the National Association. Every man who leaves his engine during a strike should be put in the same class. Any man who is found guilty of accepting a commission or bonus on anything he advises his employers to buy or use should be expelled. Hold aloof from political or other amalgamations. Let us as engineers elevate our standard, and improve ourselves morally, socially and intellectually, and the day will come when the engineer will be considered something more than a grease slinger or a coal heaver. Let rum and trade unions alone."

A set of rules were adopted, and the following officers elected: Henry D. Cozens, President; George M. Barker, Vice-President; A. M. Davy, Secretary; James G. Beckerleg, Treasurer; Arthur G. Hounsell, Conductor; N. W. Williams, Doorkeeper. Both practical engineers and employers should work together to make this society signally successful.

A Neglected Industry.

In our issue of October 7, 1882, under the above heading, by way of forcible illustration, we suggested improved burglars' tools as an important addition to the line of goods that might be advantageously manufactured in the State, county and city prisons of this country under the contract system. On the theory that the prisons of the country must be "made to pay" (and this seems to be the only argument upon which the contract system rests), we pointed out that any proposed course which would tend to increase the number of prisoners to be employed should receive the careful consideration of our legislators, it being now practically assumed by them that the unconvicted portion of the community outside have no rights which prison contractors are bound to respect.

Since this article appeared we have received a rather warm letter from Mr. James L. Wishart, a former correspondent of the AMERICAN MACHINIST, and now engaged as Superintendent of the Nebraska Manufacturing Company, manufacturers of agricultural implements and foundry castings in the State Prison at Lincoln, Nebraska, in which he says:

"In your issue of October 7, 1882, there appears a letter headed 'A Neglected Industry.' The tone of the article would lead us to believe that the writer is very much in favor of giving more rest to the convicts in our State prisons than would be good for their physical development; in short, that he is strictly opposed to their working at all. If I am mistaken in my explanation of his letter, it would be well for him to (and I hope he will) give us a letter stating his views of what ought to be done with the convicts, and if the gentleman will be kind enough to give us his name and address in full, we will reply to his letter, unless in his explanation he takes back what he has said in part in the article referred to. My reason for asking his name is that I am opposed to beating the air, and as he states in his article that much has been said on the convict labor question, I will close by saying that all the articles I have seen in mechanical papers on that subject have been rather one-sided."

In reply, we will state that the article in question was not "a letter," from a correspondent, but an editorial utterance, for which the AMERICAN MACHINIST assumes the entire responsibility.

To the suggestion that the views expressed in our article favor the enforced idleness of convicts, we reply that such was not our intention, and we do not see how such an inference could be drawn from this or any other utterance of ours upon this subject. We take it that the only difference of opinion between our correspondent and ourselves upon this topic, relates to the proper method of employing convicts in useful work, both with reference to the welfare of the convicts, the financial advantage of the State, and the prosperity of the community.

To the request that we state the method which we favor, we reply that we are not law-makers, and that our object was simply to call attention to the defects of the present law, that discussion might be elicited which would lead to the enactment of laws in the interest of the whole community.

As to methods that might be considered there are several:

In view of the fact that a large proportion of the convicts drift into prison for lack of the specific knowledge which would enable them to make an honest living, the prisons might employ convicts in useful trades, under proper restrictions as to sales of products, taking pains to vary the employment of each man from time to time, so that when he leaves the prison he will be master of a complete trade and be able to maintain himself honestly. On leaving, a reasonable proportion of his earnings while in prison should be given him, as a little capital to start on. The chief objection to this plan, in the absence of any system of State support to technical schools is, that the State would be giving educational advantages to its convicts which it does not give to its well-behaved citizens.

The State could employ its convicts to advantage on public works. Or it could establish a reformatory farm, and employ them there in a way that could not be said to compete disastrously with any honest laborer or farmer. Cities could require their convicts to clean the streets at night, or do other useful work, which would relieve the taxpayers of the city without doing harm to either. In Great Britain every prisoner is restricted to employment upon public works.

Prisoners can also be employed in pursuing new branches of manufacture which are not generally carried on in this country, relieving by so much the necessity of importing foreign goods.

They can be employed in existing branches of manufacture, limiting the men employed in any branch to a number which will not bring about disastrous competition, and the prison officials can be required to dispose of the products of prison labor at public auction, or otherwise, at prices bearing some close relation to market price. It is not the employment of prisoners in manufacturing which is distasteful to honest workingmen, but their employment in a manner which is prejudicial to the true interests of the community. No one will contend that prisoners should earn nothing, or that they should in no way recompense the State for their maintenance, any more than sensible people will contend that the United States postal service, for example, should be carried on gratuitously. Low rates of postage and extended facilities are of more importance to the public than that this department should earn a certain money profit in a certain year. In like manner a moderate assessment for the maintenance of prisons, if the system requiring it be otherwise advantageous, would not be the unmixed evil that many suppose. But, with good management, we believe every prison could be made practically self-supporting.

Literary Notes.

N. W. AYER & SON'S AMERICAN NEWSPAPER ANNUAL for 1882 has just been issued in its usual neat and convenient style. We have in previous years had occasion to say that this work constituted the most complete, reliable and useful newspaper directory of which we had any knowledge. A perusal of the volume now before us gives us no reason to change that opinion, any further than to add that it shows improvements upon those preceding it. It contains 832 pages, being about a hundred more than the "Annual" of 1881. About 200 pages in the back part of the volume are devoted to advertisements of prominent journals and magazines. An excellent feature which renders these announcements of value both to the user of the directory and the advertisers themselves, is a reference opposite the name of each of those papers in the directory part to the page where special information is given by the advertisement. No second search is needed to trace out all the particulars given about any paper, and no advertisements appear in the directory portion.

The number of newspapers in the United States is now 11,183, being 540 more than described in the "Annual" last year. The growth and progress of newspapers keep pace, not alone with the increase of population, but with the advance of intelligence. Comparing the list with that of 1881, we observe that the number of newspapers has decreased in the following States: Maine, New Hampshire, Vermont, Maryland, Virginia, Georgia, Louisiana and Nevada. Vermont has but 61 against 75 reported last year. Each of the other States shows an increased number, Pennsylvania leading with 68 more than heard from last year, followed by Illinois with 55 more, New York with 39 more, and Missouri with 33 more. Only one of the territories, Arizona, shows a decrease.

The list of scientific and mechanical publications foots up 123 against 115 last year. It is a little singular that the circulations given are in most cases precisely the same as reported in the last preceding Annual. In regard to obtaining statistics of circulations the preface says: "In the edition for 1881 an effort was made to procure affidavits, in the belief that their general use would increase confidence in the statements of circulation appearing in it. We were gratified by the results of this effort, affidavits having been received from nearly nine hundred newspapers. In entering upon the revision for this edition we determined, if possible, to very materially increase the number, and have succeeded in obtaining about eighteen hundred. In a few instances affidavits have been received which were evidently made to cover special issues. As these would be likely to mislead rather than aid an advertiser they were rejected, and the circulation in such cases either estimated or omitted altogether."

We observe that only eight of the scientific and mechanical publications have presented affidavits of their circulations, but this is twice the number that gave such evidence last year. The AMERICAN MACHINIST has every year furnished affidavits of circulation for the "Annual" as regularly as asked to do so, and it is somewhat gratifying to note that the amount is considerably larger than that of any other journal of its class which has seen fit to testify to its circulation, being actually *twenty-five per cent. greater than it was last year.*

The work gives a description of each State, territory and county in the United States, its location, area, character of surface and soil, chief products and manufactures. The publishers, N. W. Ayer & Sons, Philadelphia, sell the "Annual" at $5, which, all things considered, is a reasonable price.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(383) C. S., Milwaukee, Wis., asks: Can I get more power by using a long screw-driver than by using a short one, and if so, why? *A.*—See answer to T. R., in the AMERICAN MACHINIST of Sept. 10, 1881.

(384) T. J. M., Auburn, N. Y., writes: I want to make some small brass castings. Can I make them in plaster-of-Paris moulds, or if not, how? *A.*—Make them in fine moulding sand in the usual way.

(385) F. S., Philadelphia, Pa., writes: My bicycle has been nickel plated, but the nickel is wearing off. Can I restore it by lacquering, and if so, how? *A.*—No. You will have to remove the parts and have them replated.

(386) C. L. H., Lynn, Mass., asks: Will you tell me how the main cables of the East River Bridge were carried from pier to pier? *A.*—The cables were made up in place, the strands of which they are composed being taken from the reels and across from pier to pier by means of a small endless wire cable.

(387) G. M. D., Dexterville, Wis., asks: Will you please tell me the proper proportions of steam and exhaust ports, bridges and slide valve, for an upright engine, cylinder 6″ in diameter and 7″ stroke, the engine to make 200 revolutions per minute; plain slide valve? *A.*—Steam port 5″×⅝″; exhaust port 5″×1¼″; bridges ⅝″; steam lap of valve ⅝″; exhaust lap 1-16″; travel of valve 2½″.

(388) J. A. T., Bordentown, N. J., asks: How do you calculate the horse-power of a boiler from the dimensions, or the dimensions from the horse-power? *A.*—In a well proportioned boiler 12½ feet of heating surface may be considered equal to a horse-power. The heating surface is the surface with which the heat from the furnace comes in direct contact.

(389) C. Q. H., Paducah, Ky., asks: Will you please tell me how much greater the friction of a car axle journal is than the friction of the wheel on the track? *A.*—This depends on so many circumstances, such as the diameter of wheels; the kind of track and its condition; the quality of lubricant, &c., that no general comparison can be made. Under favorable conditions there is not much difference in extent between the journal and the axle friction.

(390) A. B., Fort Wayne, Ind., asks for a rule for laying out a worm and worm wheel. He says a friend tells him that the diameter of the worm should be four times the pitch; also that the diameter of the wheel should be four times the diameter of worm. He asks: 1. Is this correct? *A.*—Probably what your friend meant to say was that it was better not to have the proportions less than these. There is no particular objection to making the wheel as much larger than four times the diameter of the worm as you may desire. For information as to laying out the teeth, see the AMERICAN MACHINIST of Feb. 7, 1880.

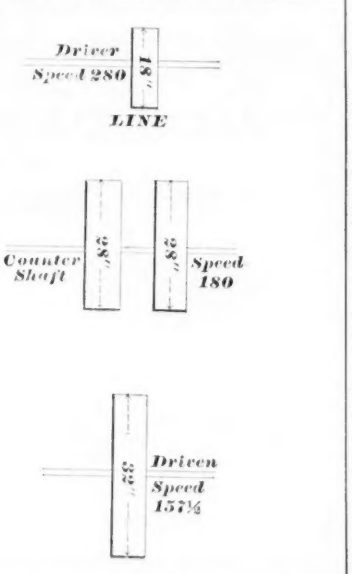
(391) S. B. W., Des Moines, Iowa, asks: 1 Please inform me if water once started will continue running through a 12″ pipe, from a lake, over an elevation of 28 feet and down on the other side, the end of the pipe at the outlet being 4 feet below the level of water in the lake? *A.*—It is somewhat doubtful, 28 feet being, practically, about the extreme elevation over which water can be carried in this way. Four feet is also rather small for the difference of level, in the case of so large a pipe. See answer to R. E. 2. Taking a distance of one mile on the earth's surface and drawing a straight line from one end of that line to the other, how far apart would those lines be at the center? *A.*—According to *Haswell* the curvature of the earth's surface is 6.99 inches per mile.

(392) J. F. S., New York City, asks: 1. How can I calculate the area of a circle 1-66″ in diameter? *A.*—Square the diameter and multiply by .7854. The square of 1-66″ is 1-66x1-66=1-4356, which multiplied by .7854 is 1-4356x.7854=.001803″, the area. 2. Can I bore a taper hole say, 9″ at one end and 15″ at the other, the piece being 9½ feet long? *A.*—By running the outer end in a steady rest you can use the boring bar as described by Geo. B. Foote, in the AMERICAN MACHINIST of Mar. 25, 1882; or you can clamp the work to the lathe bed and use such a bar, leaving the tail stock set as for turning straight, and get the taper by throwing the center of the bar next the head stock to one side of the axis of the bar, and then revolve the bar with the lathe and feed the cutter head through the piece.

(393) Scotty, Red Bay, Canada, asks: 1. Will you describe what should be done in laying up a high and low pressure marine engine for the winter? *A.*—There is no prescribed plan to be followed. You should see that there is no water left in any parts that will freeze and cause damage, or cause any of the parts to rust. Such parts as will be likely to rust should be protected with tallow and white lead, and any fibrous packing should be removed from contact with iron rods, etc. Some engineers remove their pistons, while others leave them in place. It is altogether a matter of judgment, in protecting parts that are liable to injury from any cause. 2, How long should a boiler last in fresh and how long in salt water? *A.*—It depends entirely upon the kind of boiler, and the usage it gets. Perhaps from one to twenty years in fresh, and from one to ten in salt water. 3. How do you calculate the capacity of a feed pump for any size of boiler? *A.*—Make the pump of such dimensions that it will discharge one cubic foot of water per hour for each horse power of the boiler.

(394) R. E., Enterprise, Miss., writes: We have a syphon, the longer leg of which is five feet and the shorter leg three feet. This is used for conveying water from a creek to a cistern. It breaks or ceases to work, at times, and we then have to turn it up and fill it. We now wish to put in a larger one, and it will be impracticable to fill this one as we do the smaller one. I would like some information as to length of legs; also how I can arrange to fill it without lifting it out. Is it practicable to arrange stop-cocks at each end, and another at the center for filling? *A.*—The reason the syphon stops is that air gradually finds its way into the pipe. The length of legs, practically, is not the length as measured by the pipe, but the difference of level of water in the creek and the cistern. Make this difference as great as practicable, as the greater the difference the greater will be the flow of water. Keep both ends of the pipe under water. You can use the valves as you suggest. The stop-cock spoken of as being at the center, should be at the highest point of the pipe. The pipe including the cock at the center, must be quite air tight. Large syphons are usually arranged with a self-acting air valve at the highest point in the pipe. This is simply a case on the top of the pipe, in the top of which there is a small valve. To the bottom of the valve is attached a float which partially occupies the space inside the case. The operation is as follows: Air in the water finds its way to the highest point (which is the case) and gradually displaces the water till the float drops and opens the air valve, letting out the air, when the case fills with water and closes the valve. The pipe can be filled through this air valve, by closing the stop-cocks at the ends of the pipe.

(395) F. A. H., Indianapolis, Ind., asks: Please give your opinion on the following matter which is in dispute between several of your readers: We wish to transmit power across a 16-foot alley, from one shop to another, according to the



accompanying diagram. Now my opponent claims that there will be a saving of power by making the driver on the line shaft larger and belt from it to a smaller one on the counter-shaft, and from a larger one on the counter-shaft to an appropriate size on the second line shaft. I claim that we may dispense with the counter-shaft, for the sake of argument, and consider the matter in its simplest form, and that it would be simply changing pulleys without gain or loss. *A.*—For transmitting power a distance of 16 feet it is unnecessary to use a counter-shaft. Make a direct connection with a single belt. The introduction of a counter-shaft will entail loss of power through friction, besides unnecessary expense. Putting a larger pulley on the driving or main line and a smaller one upon the counter-shaft will cause a greater loss through friction than if the counter-shaft was made to run at the same speed as the main line; then make the desired change in speed between the counter-shaft and the final or driven shaft. If you were to use two belts within a distance of 16 feet as you say, using a counter-shaft, there would also be a large loss through slipping of the belts if they were worked up to anything like their capacity. For any further information we refer you to Shop Kinks, No. 38, by L. F. Lyne.

(396) C. W. Macy, New Haven, Conn., asks: Will you please inform me how to determine the horse power of an engine 5″x7″, running at 200 revolutions per minute? What I want to know is how to determine the pressure when the diameter and revolutions are given. *A.*—You can calculate what is termed a *constant* for any engine, that is, the power that would be developed in the cylinder at one pound pressure, and from this you can calculate the power at any pressure. To obtain this constant multiply the net area of cylinder by the speed of the piston in feet per minute, and divide the product by 33,000; the product will be the horse power for each pound mean effective pressure in the cylinder. For example, your cylinder is 5″, the area of which is 19.63 inches. To find the *net* area you must subtract from this one-half the area of the piston rod, which may be assumed to be .45 inches, leaving the net area 19.65—.45=19.18 in. The piston speed is (7x2x200)÷12=233.33 feet per minute. Then (233.33x19.18)÷33,000=0.135, which is the horse power for each pound of mean effective pressure. Suppose now you carry 80 pounds boiler pressure, you can calculate on about 35 pounds mean effective pressure in the cylinder, provided your steam and exhaust pipes and valve and ports are properly arranged. The indicated power of your engine will then be 0.135x35=4.725, horse power. The friction will be, say 25 per cent. of the indicated power, making the effective power about 3⅛ horse power.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

C. M. Morse, Mech. Engineer, 132 Nassau St., N.Y.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Pat's mf'd on royalty. A. B. McCool, Pottsville, Pa.

J. M. Badger, Expert and Commission Dealer in Machinery, 5 Dey Street, New York.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

The American Standard of Bolts and Nuts saves time otherwise wasted discussing sizes. Price $1. E. Lyman, C.E., New Haven, Conn.

Pattern Maker's Assistant. By Joshua Rose. 324 pages, $2.50 by mail, postpaid. Address orders, P. O. box 3,306, New York City.

A lot of 25″ lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

Wanted—To sell a Richards' Indicator in good condition. Address, F. G., Box 1, AMERICAN MACHINIST.

For Sale.—Steam Engine, extra heavy, in good order, upright, two cylinders, each 12″x20″, heavy fly wheel 7′x2′, Judson governor, bed stone, &c David W. Pond, Worcester, Mass.

Mechanical Engineering.—To learn inventing, designing and construction of machinery at school. Address, S. W. Robinson, Ohio State University, Columbus, O.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John street, New York. Mention this paper.

L. V. Conover, Iron Founder, 336 to 340 East 29th Street, New York. Heavy and Fine Castings of Iron, Brass, Composition and Copper made to order at shortest notice.

We will pay 25 cents each for copies of the AMERICAN MACHINIST for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Wanted to arrange with the right parties for the manufacture on royalty or otherwise, of a first-class automatic cut-off engine. Address, Box 10, care AMERICAN MACHINIST, 96 Fulton street, New York.

Boiler Shop Tools.—Patent Bending Bolts, Boiler Plate Planers, Combined Punch and Shears, Single Punches or Shears of short or very long reach, Horizontal Flange Punches, Double or Single Bar Iron Shears, Radial Drills. Send to Hilles & Jones, Wilmington, Delaware.

Simpson's Manual of Screw Cutting, complete, containing rules for threads of any pitch, plain and fractional, double and triple, with two or four gears, United States and Whitworth's standard threads. Single copies 25 cents, or 5 for $1. Address, W. Simpson, P.O. box 46, East Boston, Mass.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Rocks, Minerals and Stocks; by Frederick H. Smith, Consulting Engineer and Geologist. Contents: Part I. World Building, Prime Minerals and Rocks, the Formation; Part II. Gold and Silver, Industrial Metals, Coal and Oil, Industrial Minerals, Precious Stones; Part III. Stock Companies, Stock Dealing, Stock Tricks. *A vade mecum* for the use of everyone interested in these important topics. Scientifically accurate, witty, fascinating. *Sui generis* among technical books. Handsomely bound in cloth, $1.50, in paper, 75 cents. Order through your bookseller, or address The Railway Review, 182-184 Dearborn St., Chicago, Ill.

MANUFACTURES.

The Lanphear Machine Co., Phœnix, R. I., have just started up their new foundry, 130x40 feet.

Ebersole & Kailey, Canton, O., are about to bring out a new milling machine.

The new Holyoke, Mass., Foundry has started work. This is an establishment that will bring about seventy-five skilled workmen into the city.

The Washburn Car-wheel Company, at Hartford, Conn., has ordered a $3,000 lathe and boring machine for its foundry.

The new locomotive works at Garfield, Ill., to be completed in three or four months, are under the superintendence of Franklin D. Childs, of Boston.

The Chicago Polished Steel Shafting Co., South Chicago, Ill., have completed their works and will soon place their polished shafting on the market.

A joint stock company consisting of some of the most reliable business men in Iowa has been formed in Council Bluffs, for the purpose of manufacturing shot from iron.

The Youngstown, O., Steel Works are pushing the completion of their new buildings, and they will be ready to make steel castings early in November.

The Richmond (Ind.) Machine Works are furnishing a 80-horse power engine to the Rockford (Ill.) Burial Case Co., also one to the Rockford Chair and Furniture Co.

At Lawrence, Mass., Stedman, Northrop & Smith, machinists and builders of all kinds of worsted machinery, are putting in a lot of new tools preparatory to extending their business, and also to manufacture card clothing.

The *Boston Bulletin* says from 18,000 to 20,000 hands are employed by the great general hardware manufacturing concern of the Peck, Stow & Wilcox Co. They have four manufactories in Connecticut and one in Cleveland, O.

The Dominion Bolt and Iron Company, Toronto, Canada, is about to be organized with a capital of $500,000. Property has been acquired on the lake front, directly east of the Humber River, comprising about 100 acres in all, including the water lots.

At Hartford, Conn., the Billings & Spencer Co have recently purchased the file shop property, and are erecting new buildings thereon, and increasing the number of drop hammers, making 34 in all, an increase in 12 years of from 2 to 34.

Smith, Beggs & Ranken, St. Louis, Mo., are working overtime, and have lately shipped a number of Corliss engines to Chicago, several elevators to Kansas City, grain elevators to Peoria, Ill., and another large lot of mining machinery to the Rosario Mining Company, Salinas, Mexico.

The New Orleans *Times-Democrat*, in an editorial, says that Havemeyer Brothers, of New York, have purchased two squares of ground between Bienville, Custom-house, Front, and Decatur streets and will erect thereon a sugar refinery, the plant being $400,000.

The N. E. Piano Co. have purchased the Gray Cotton Mill, George street, Boston Highlands, and have refitted it in a first-class manner and put in new machinery complete. The contract for heating and ventilating with hot air, utilizing exhaust steam for this purpose, was given to Gardner C. Hawkins, heating and ventilating engineer, Boston.

The Syracuse Iron and Tube Company have just started their works at East Syracuse, N. Y., where they have a block of buildings 500x300, and are the only boiler-tube manufacturers in the State. The buildings are fitted with two furnaces and all new machinery, driven by four steam engines situated in different parts of the building. Machinery to double the capacity of the works, additional furnaces, and a rolling mill will be added next season. The company have $250,000 capital, and, when running full, will employ 1,000 men.

J. B. Reed Cairo, Ill., has under way twenty-five to thirty lathes, both large and small, which he finds a market for before completion. His 26″ swing lathe, 8 feet between centers, weighs 5,800 pounds. It has a compound rest, cross-feed and some particular improvements. The lathe is modeled after Philadelphia patterns, but is made somewhat heavier. Mr. Reed proposes to make tools that for strength and working qualities will compete with those of the best Eastern manufacture. His force of hands is being increased as fast as he can secure the skilled workmen he wants. Charles St. Clair is foreman of the establishment.

T. H. Paul & Son, of Cumberland and Frostburg, Md., have decided to remove their machinery works from those two cities to Baltimore, where the firm will erect large buildings, with foundry, machine shops, &c., and will extend their facilities so as to turn out locomotives from the establishment complete. After January 1 it is understood the firm will have no more work done at the Mt. Savage shops. The works in Baltimore, for which it is understood ground has been broken, will be located near Riverside Park, in the southern section of the city. The works will be quite extensive, and it is expected that about 400 men will be employed when they are running full. It is expected the machine-shop portion of the works will be ready for occupancy about December 1. The foundry portion will not be ready until some time in the spring.

Machinists' and Engineers' Supplies.

NEW YORK, Oct. 26, 1882

There has been little developed in the supply market in the way of an increase of orders since our last report and trade continues of moderate proportions. The deliveries of large machine tools such as lathes and planers continue slow, but orders for other tools and supplies are promptly filled.

Benj. F. Kelley, 20 Cortlandt street, New York, has taken the Eastern agency Baragwanath Steam Jacket Feed Water Heater and Purifier, manufactured at the Pacific Boiler Works, Chicago, and the Jenks Duplex Indictor, manufactured at Detroit, Mich.

Wrought Iron Pipe can be bought at 62½ per cent. discount from list in large lots.

Iron and Metal Review.

The Pig Iron market continues quiet and steady with no new features. Consumers persist in their conservative methods and there has been no accumulation of stock worthy of notice. Prices continue firm, which we quote as follows: Foundry No. 1, $26 to $27. Foundry, No. 2, X, $23.50 to $25. Grey Forge, $20.50 to $21.50. The market for Foreign Iron continues quiet and the demand light with prices slightly easier. Some brands for shipment may be obtained at a slight concession. We quote the following prices: Coltness, $27.50 to $28; Glengarnock, $25.50 to $26; Gartsherrie, $26.25 to $26.50; Summerlee, $26 50; Carnbroe, $24.50; Eglinton, $23.50 to $24; Langloan, $26 to $26.50. Steel and Iron Rails quiet at $45 to $46, for steel, and iron same as last reported.

Merchant Bar Iron is still held at 2.6c, card rate but large buyers will not pay over 2½c. Copper continues quiet at 18c. to 19¼c.

Banca Tin 28c.; Straits and Malacca 23¼c. to 23¾c.; Australian 23¼c. to 23¾c.; Billiton 25½c.; English Lamb and Flag 23¼c.; Spelter 5.35c. to 5.45c. for common western; Refined 8c. to 8¾c.; Silesian 5.35c. to 5.50c.; Lead Common, 5c. to 5.05c. Refined 5.10c; Antimony, Hallet's brand 10⅞c.; Nevada, 12¼c. Cooksons, 12⅞c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted a machinist to do canvassing in New York city and vicinity. Address, "B," care of AMERICAN MACHINIST.

Wanted—A permanent traveler to represent the Gardner Governor. Must be well posted. Address, R. W. Gardner, Quincy, Ill.

Mechanical draughtsman and superintendent with good practical experience, wants employment. X., care AMERICAN MACHINIST.

Situation as draughtsman wanted by a thorough practical machinist, has had 15 years' experience as pattern maker, machinist and draughtsman. Address, 999, AMERICAN MACHINIST, N. Y.

A competent mechanical draughtsman wants a situation. Applicant has 10 years' experience in general machinery and engine work. Address, Active, box 8, AMERICAN MACHINIST, New Yark.

Wanted—A superintendent for iron works manufacturing engines, mining machinery, etc. Must be well up in engine work, sytematic and a driver. Address, stating experience and reference, Brown, office AMERICAN MACHINIST.

Wanted—By a responsible company, some machine shop and foundry to manufacture machines which requires light and medium work, will require a capacity of 100 men, capable of being increased to 200. Address, C., AMERICAN MACHINIST.

Wanted—A situation as Superintendent or Foreman in a shop where steam engines and general machinery are built, by a man of large and varied experience in such work. New York reference. Address, Geo. Shires, 328 W. 30th St., N. Y. City.

Draughtsman—Of theoretical knowledge and of long practical experience in the construction of marine and stationary engines, sugar plantation machinery and general mill work, is open for engagement; will go anywhere for a reasonable salary, and where engineering is wanted. Address, Draughtsman, AMERICAN MACHINIST.

Fine machinist wanted—An intelligent young man who is a first-class machinist, has some knowledge of draughting, can invent and construct special machinery, to make small articles in hardware, manage employes systematically and economically, is well recommended as to character and abilty, is willing to work and learn, can find a place to work up by addressing, The Y. M. I. Co, Youngstown, O.

Wanted—500 feet of 42-inch diameter old boiler shells. Address, P. O. Box 1208, New Haven.

Wanted a good second-hand watchman's time detector. Address H, Box 1,024. New Haven, Conn.

Every one interested in machinery needs the *Machinery Trade Register*. Subscription one dollar. Merchants & Manuf'rs' Agency, 682 Broadway, N.Y.

For sale—A Hittinger & Cook engine, 12x36, in good order. Apply at Hydraulic Works, VanBrunt street, South Brooklyn, New York.

For Sale Cheap—Screw Press in first-class order, weight about 1800 lbs. J. Wood, 319 W. Randolph street, Chicago, Ill.

Felthousen's Improved Automatic Cylinder Lubricator will put oil where it is wanted at the proper time, and in proper quantities. Sent on trial or applied to engine by C. M. Morse, 132 Nassau St., New York.

Second Annual Exhibition Fair

OF THE

New England Manufacturers' and Mechanics' Institute

IS NOW OPEN IN BOSTON.

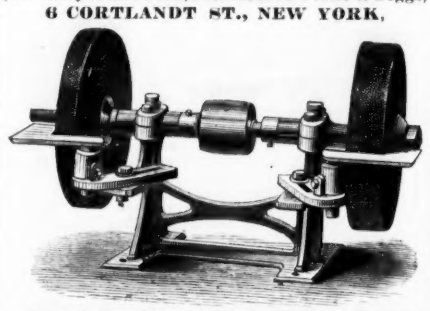
The largest exhibition building in the United States. Ten acres of industrial exhibits, displaying the wonders of mechanism, Science and Art. The largest display of Machinery since the CENTENNIAL, all in operation, and showing the processes of manufacture **Carpet Weaving, Cotton Weaving, Silk Weaving.** The great railroad display of Atlanta duplicated. The leading industries of the North, South, East and West fully displayed, making a NATIONAL EXHIBITION.

DON'T FAIL TO VISIT THE EXHIBITION FA'R.

COOKE & CO.

(Formerly Wm. Cooke, successor to Cooke & Beggs)

6 CORTLANDT ST., NEW YORK,



Agent for the Lehigh Valley Emery Wheels & Emery Wheel Machinery.

Our wheels possess superior cutting qualities, combined with great durability. Eureka Plow Polisher and Patent Stove Plate Grinders.

The Brayton Petroleum Engine Company,

OFFICE AND SALESROOM:

50 FEDERAL ST., BOSTON, MASS.

OLIVER AMES, Pres't. EDWIN R. EATON, Sec'y.
AMOS S. STETSON, Treas. and Gen. Manager.

WORKS AT EAST BRIDGEWATER, MASS.

SAFETY! ECONOMY! CONVENIENCE!

No Boiler. No Coal. No Engineer. No Danger. No Steam. No Ashes. No Explosion. No Fires. No Extra Insurance. Almost no Attendance.

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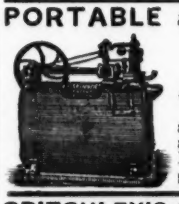

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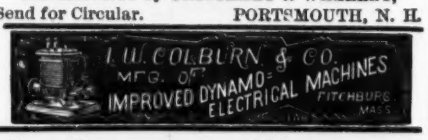

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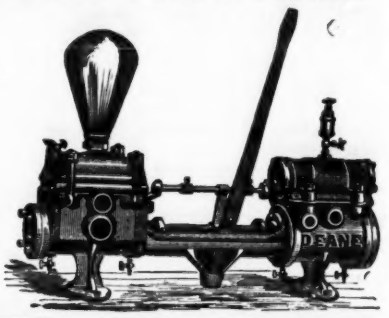

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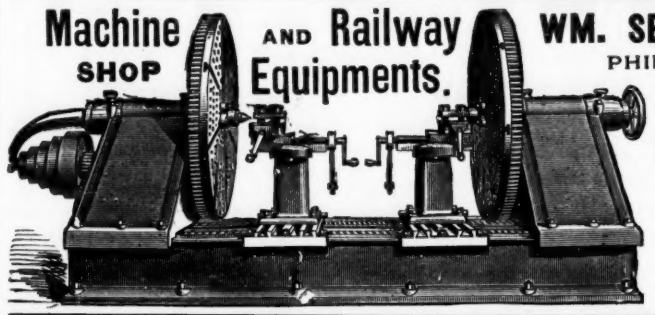

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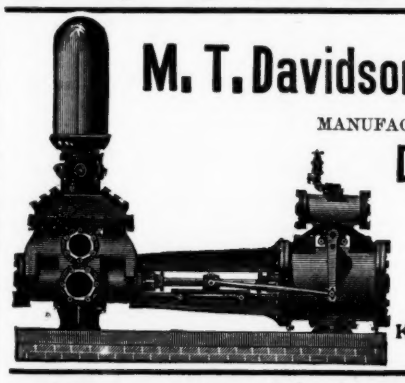

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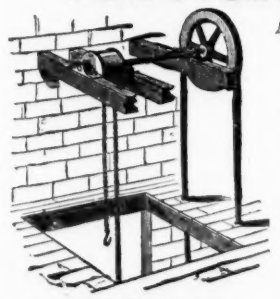

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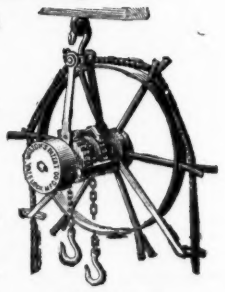

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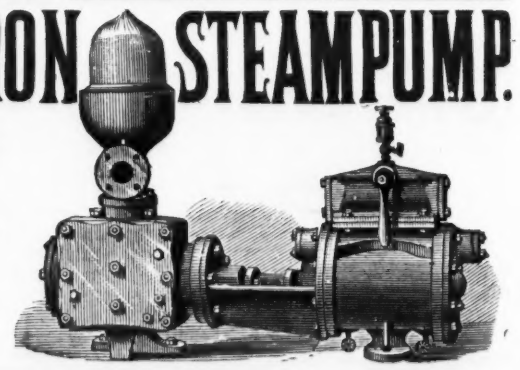

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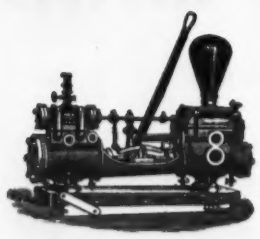

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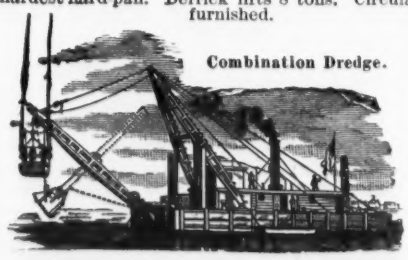

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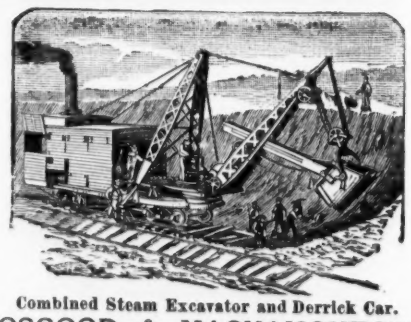

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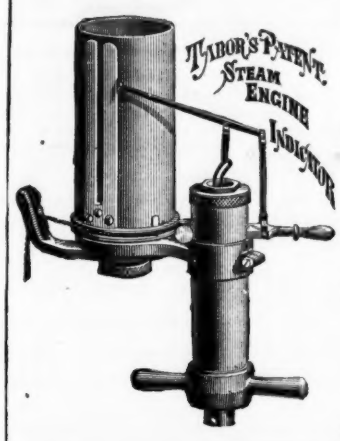

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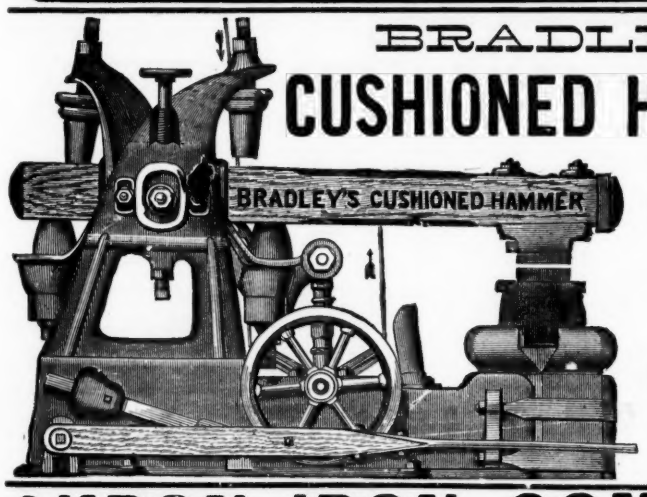

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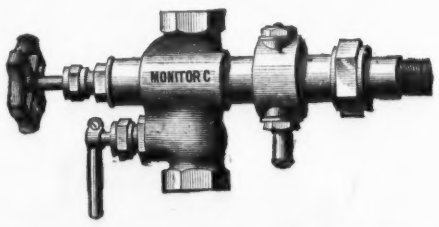

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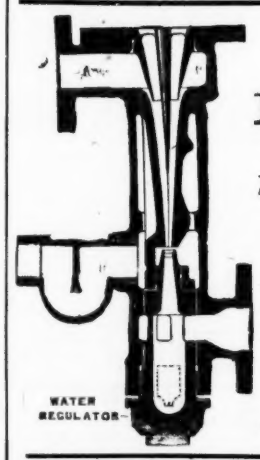

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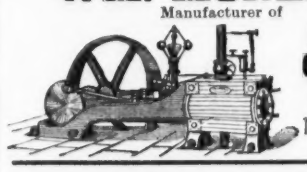
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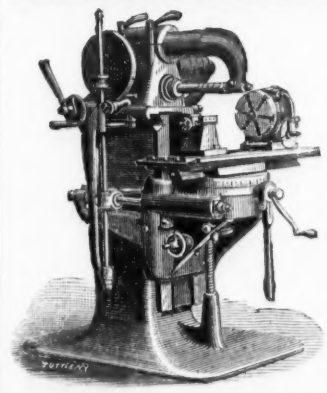
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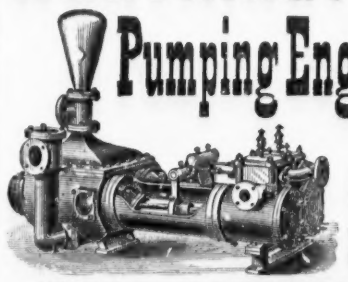
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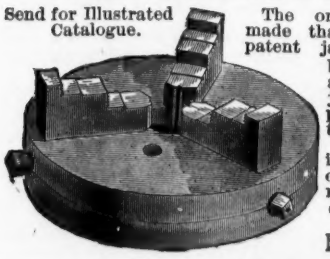

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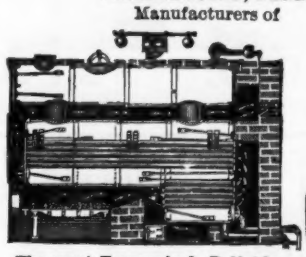

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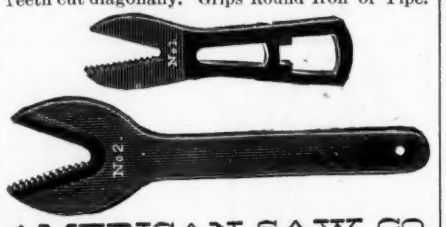

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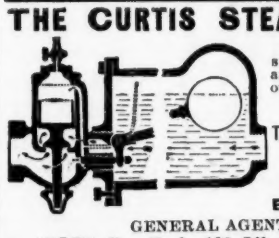

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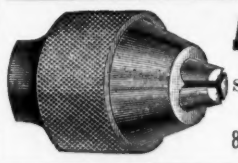

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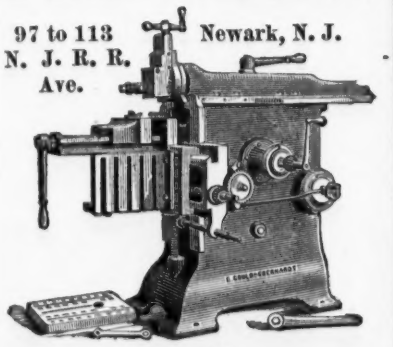

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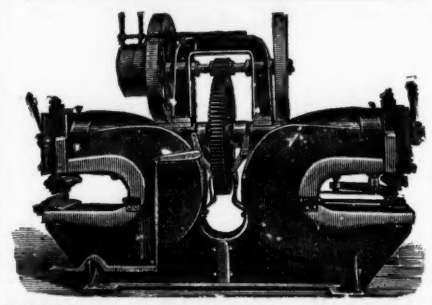

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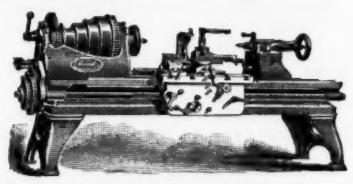

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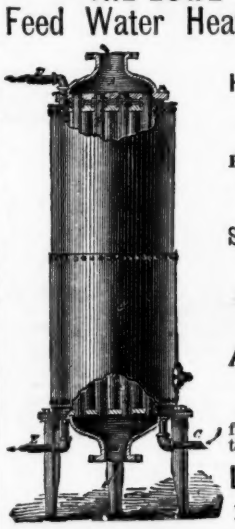

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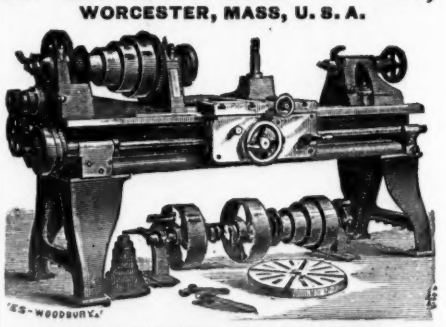

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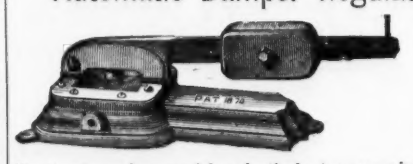

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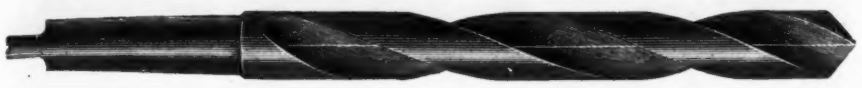

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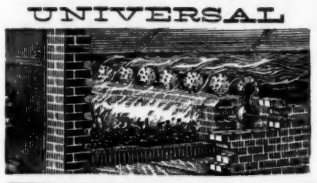

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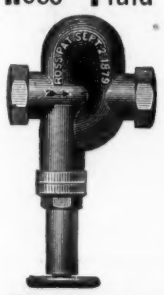

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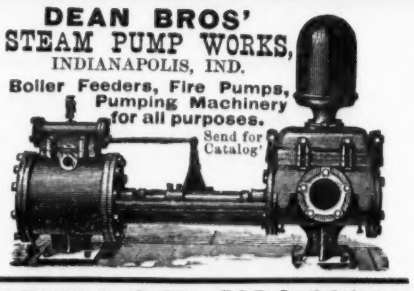

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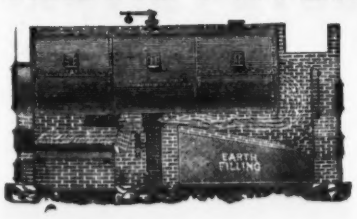

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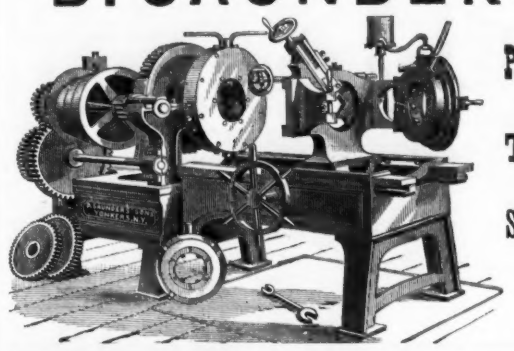

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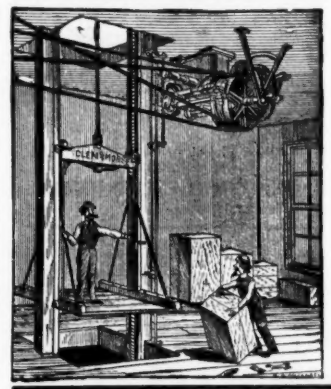

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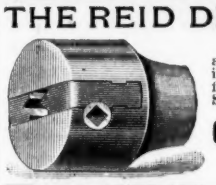

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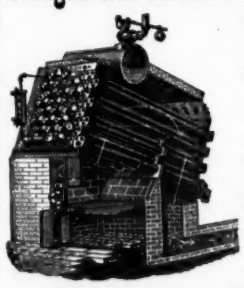

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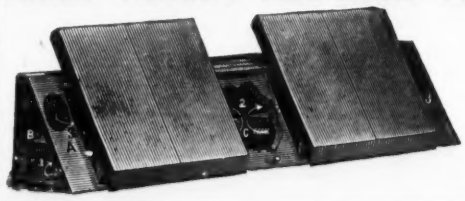

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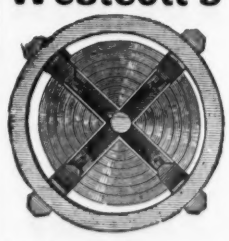

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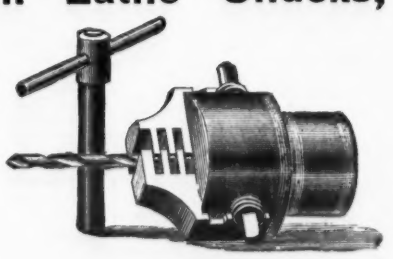

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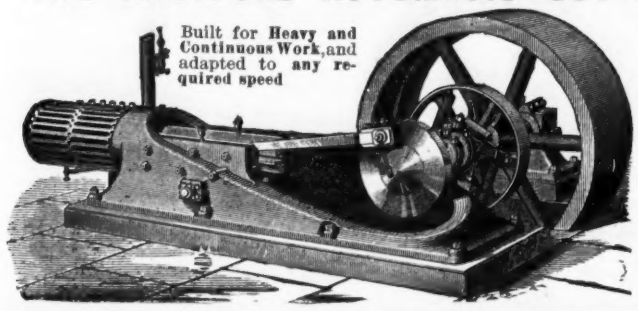

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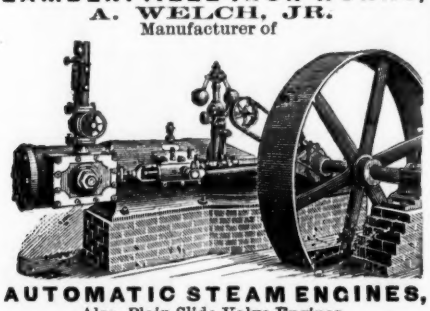

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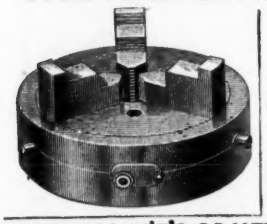

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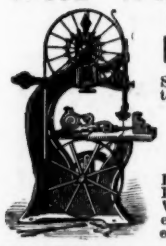

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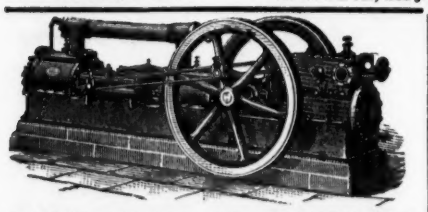

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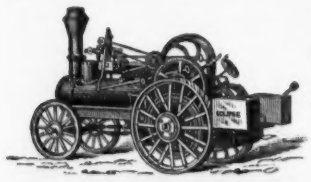

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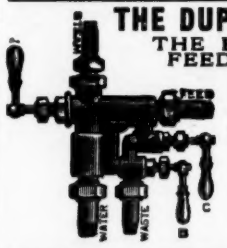

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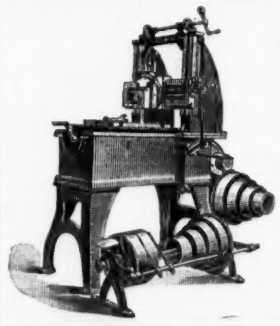

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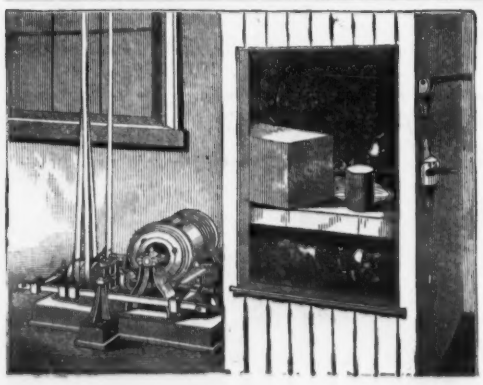

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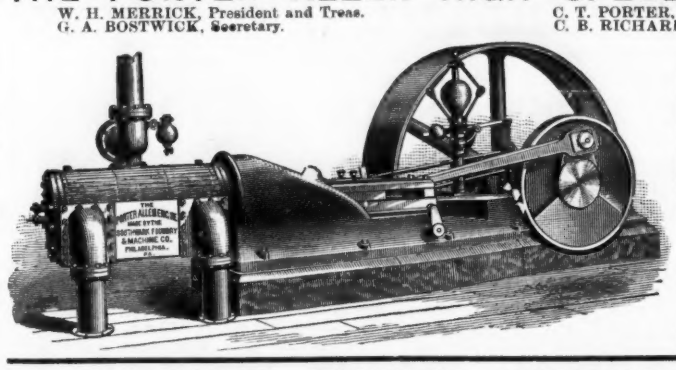

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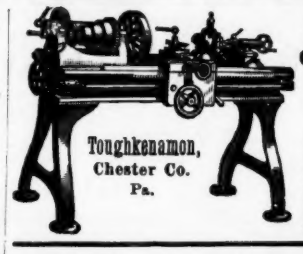

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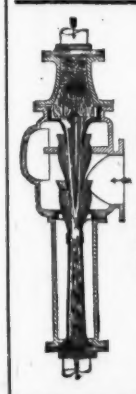

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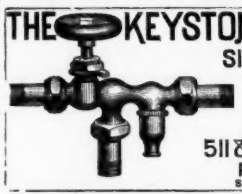

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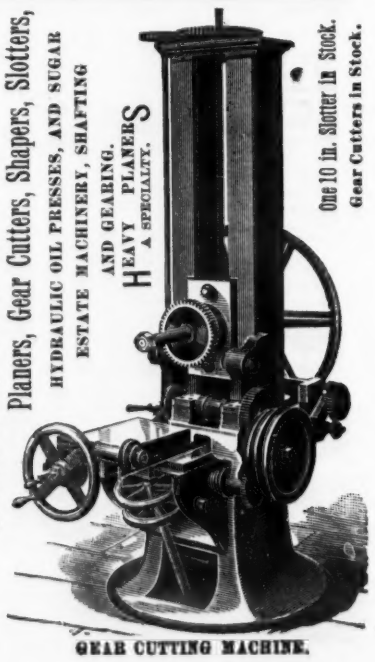

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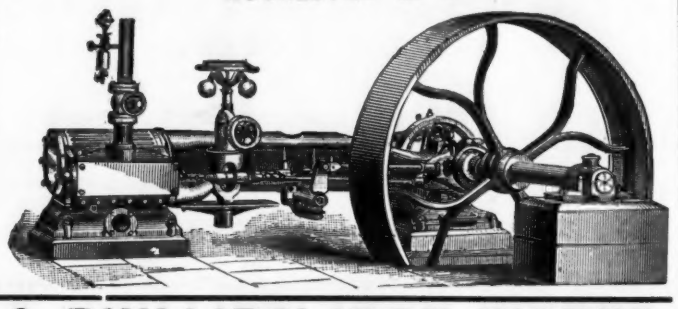

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20 " "		14 "	Fitchburg.
20 " "		12 "	Fifield.
19 " "	10 and 12	"	Gray.
18 " "	10 and 12	"	Blaisdell.
17 " "		6 "	Johnson.
16 " "	6 and 8	"	Fitchburg.
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30 inch x 30 inch x 8 foot,	Fitchburg.
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36 inch x 36 inch x 9 ft., planer. 2d hand, good order.	Wheeler.
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18 inch x 18 inch x 3 foot planer,	Gould.
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28 "		14 "	"		"	
22 "		8 "	"		"	
21 "		6 "	"		"	
21 "		8 "	"		"	
20 "		6 "	"		"	
18 "		6 "	"		"	
18 "		7½ "	"		"	
17 "		6 "	"		"	
16 "		6 "	"		"	
15 "		6 "	"		"	

Also lot NEW LATHES. Various sizes.

38	inch x 38	inch x 12	foot	Iron	Planer.	New.	
38	" 38	" 8	"	"	"	"	
36	" 36	" 11	"	"	"	"	
36	" 36	" 9	"	"	"	"	
32	" 32	" 9	"	"	"	"	
27	" 27	" 7	"	"	"	"	
30	" 27	" 10	"	"	"	"	

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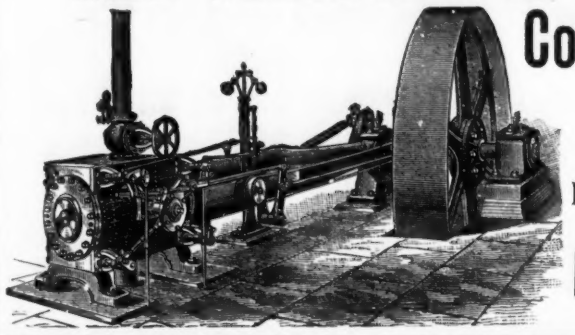

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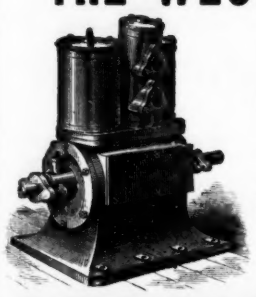

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1	" "	44 in. x 14 ft.	Good order.
1	" "	32 in. x 8 ft	" "
1	" "	21 in. x 7 ft.	" " Pond.
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1	" "	15 in. x 6 ft.	"
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1	" "	18 in. x8 & 10 ft.	Lodge & Barker "
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1	" "	20 in. x 12 ft.	Fifield. New.
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1	Plain Engine Lathe,	16 in. x 4 ft.	"
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1	"	36 in. x 36 in. x 18 ft.	"
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1	16 in. Upright Drill.		" "
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1	30 in. "	"	" "
1	25 in. swing B.G. & S. F. Drill.		Blaisdell. "
1	28 in. "	"	" " "
1	15 in. Shaper.		Gould & Eberhart. "
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1	30 in. "	14 ft. "	" "	"	Oct 10
1	26 in. swing,	14 ft. bed.	Oct. 20th.		
1	32 in. x 8 ft.	Planers.	New. Oct. 10th.		
2	12 in. stroke Slotting Machines.		New. Oct. 10.		

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1	42 in. swing,	16 ft. bed,	New Engine Lathe.		
1	New Corliss Engine.	12" x 36".	Complete.		
1	22 in. "	12 ft.	"	"	
4	18 in. "	8 ft.	"	"	"
1	17 in. "	10 ft.	"	"	
5	15 in. "	6 ft.	"	"	"
1	12 in. swing,	6 ft.	Hand Lathe. New.		
1	10 in. "	4½ ft.	Bed Hand Lathe. New.		
1	38 in. x 10 ft.	Planer.	New.		
1	38 in. x 12 ft.	Planer.	New.		
2	30 in. x 8 ft.	Planers.	New.		
2	22 in. x 4 ft.	Planer.	New.		
2	38 in. Swing Upright Drills.		B. G. & S. F. New.		
1	23 in. Drill.	B. G. & S. F.	New.		
1	23 in. "	Plain.			
3	20 in. "	"			
1	18 in. Bench Drill.				
1	4 spindle Drill.	New.			
1	3 "	"	"		
2	4 "	"	Second-hand.		
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3	Double-Acting Presses, No. 3,	nearly new.			
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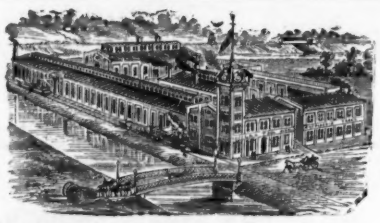

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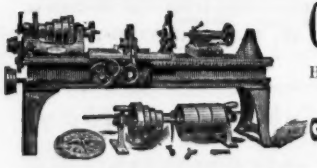

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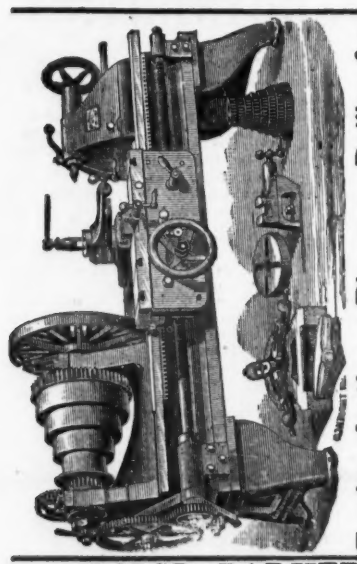

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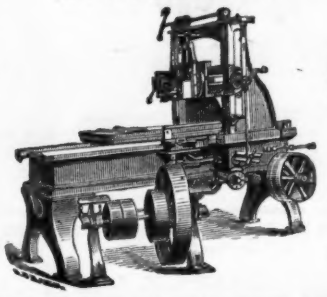

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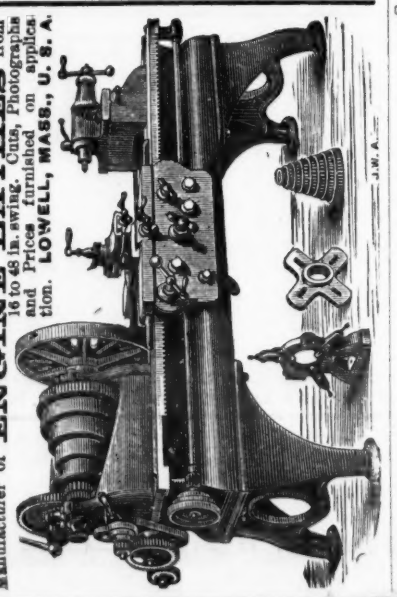

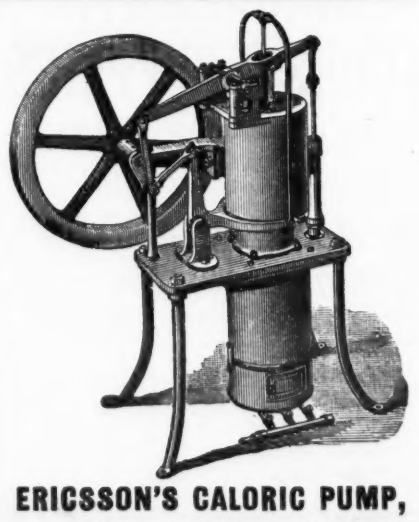

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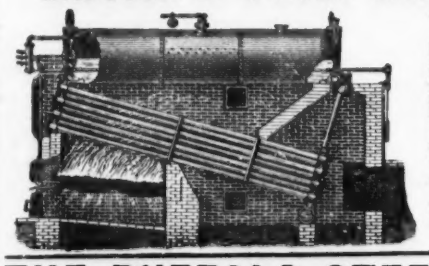

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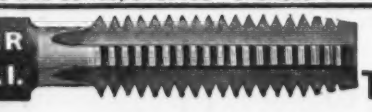

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